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Research Article

Endoscopic Thoracic Sympathectomy for the Treatment of Hyperhidrosis

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Abstract

Background: Although hyperhidrosis is regarded as a benign sympathetic disorder, it can have a significant psychosocial impact on affected individuals while markedly affecting their quality of life (QoL).

Objectives: We aimed to evaluate the effects of endoscopic thoracic sympathectomy (ETS) on the treatment of primary hyperhidrosis and patients' QoL).

Methods: This prospective interventional study included patients with primary hyperhidrosis referred to Shahid Mohammadi Hospital, Bandar Abbas, Iran, for ETS during 2012-2019. General characteristics including age, sex, and body mass index (BMI) were recorded for all patients. All participants underwent ETS by a single experienced surgeon. Patients were evaluated twice; once before the procedure and once one month after the procedure. The sites of hyperhidrosis, Hyperhidrosis Disease Severity Scale (HDSS), and QoL were the evaluated variables. Patients' satisfaction, compensatory hyperhidrosis, and procedural complications such as pneumothorax were also assessed on follow-up.

Results: From the 47 patients evaluated in this study with a mean ± SD age of 28.2 ± 1.21 years, 27 (57.4%) were men. No patient experienced compensatory hyperhidrosis and procedural complications after the procedure. Also, 45 (95.7%) patients were 100% satisfied and 2 (4.3%) were 90% satisfied with the procedure. There was a significant reduction in the number of hyperhidrosis sites and HDSS score after one month compared with baseline ($P=0.006$ and $P<0.001$, respectively). Moreover, the QoL significantly improved after the procedure ($P<0.001$).

Conclusion: ETS appears to be very safe and effective for the treatment of primary hyperhidrosis in terms of the reduction of hyperhidrosis sites and HDSS score, as well as improving QoL and patient satisfaction.

Keywords: Hyperhidrosis, Quality of life, Endoscopic thoracic sympathectomy, Disease severity

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Background

Characterized by excessive, symmetric, focal perspiration of the craniofacial region, palms, soles, and axillae, primary hyperhidrosis is considered a benign sympathetic disorder triggered by heat, stressful situations, or physical activity (1,2). Hyperhidrosis can cause psychosocial problems and therefore significantly impact quality of life (QoL) (3,4).

The underlying cause of primary or idiopathic hyperhidrosis is not well understood; however, it is believed to occur as a result of the aberrant or increased sympathetic stimulation of the eccrine sweat glands which are distributed all over the body but mostly concentrated in the axillae, face, palms, and soles (5). Accordingly, the basal level of sweat production is higher than normal in individuals with primary hyperhidrosis. They also have an increased response to normal stimuli, such as physical or emotional stress (5).

Different strategies exist for the treatment of hyperhidrosis, including topical therapies and botulinum toxin injection as first- and second-line treatments, as well as oral anticholinergics, iontophoresis, microwave energy, fractionated microneedle radiofrequency, local surgical therapy, and endoscopic thoracic sympathectomy (ETS) (5-11).

Palmar primary hyperhidrosis is the main indication for ETS, as in these patients, symptoms almost completely disappear and QoL is completely improved. However, this procedure can also yield good results for axillary and facial hyperhidrosis (12). The most common and important side effect of ETS is compensatory hyperhidrosis, with a higher risk in patients with facial hyperhidrosis undergoing ETS, because of the interruption of the sympathetic trunk at a higher level (12). Therefore, patient selection for ETS is of utmost importance.

Objectives

We aimed to evaluate the effects of ETS on the treatment of primary hyperhidrosis as well as the patients' QoL.

Patients and Methods

Participants

This prospective interventional study included patients with primary hyperhidrosis referred to Shahid Mohammadi Hospital, Bandar Abbas, Iran for ETS from March 21, 2012 to March 20, 2019. Inclusion criteria were dissatisfaction with clinical or medical treatment or failure of clinical treatment, as well as severe hyperhidrosis (a score of 3 or 4 on the Hyperhidrosis Disease Severity Scale [HDSS]). Patients with secondary causes of hyperhidrosis, including endocrine diseases (diabetes mellitus, hyperthyroidism, and hyperpituitarism), neurological diseases (peripheral nerve injury, Parkinson's disease, reflex sympathetic dystrophy, spinal cord injury, and Arnold-Chiari malformation), malignancies (pheochromocytoma and chronic pulmonary diseases), and psychiatric diseases such as generalized anxiety disorder were excluded from the study. Also, patients with a history of pneumothorax, tuberculosis, pneumonia, pleural effusion, and previous intrathoracic surgical interventions or any other condition that might have caused pleuropulmonary adhesions were excluded.

Study design

General characteristics including age, sex, and body mass index (BMI) were recorded for all patients and written informed consent was obtained. All participants were operated by the same experienced surgeon.

All patients underwent general anesthesia and were intubated with a single-lumen endotracheal tube. During the procedure, the patients were in semi-sitting position (45°) with their arms abducted at 90° using two subscapular cushions allowing the lateral motion of the surgery table and the free movement of the surgeon. The procedure was first performed on one side and then continued to the other side. A small 5cm-pack was placed under the shoulders to elevate the opening site of the ports. Two ports were used; one for the camera and the other for the cautery. The camera port was placed within the 3rd intercostal space in the anterior axillary line, lateral to the pectoralis muscles. The camera was inserted following a 7-8 mm Hg CO_2 flow. The cautery was inserted at the 4th intercostal space in the midaxillary line. The second rib was visualized at the apex of the thorax. All procedures were done below the upper border of the 2nd rib. The sympathetic ganglion is usually visualized on the neck of the ribs. If there was difficulty visualizing the sympathetic ganglion, the head of the cautery was used to specify its position. The pleura over the sympathetic chain was opened using the cautery. Depending on the site of hyperhidrosis, the necks of the ribs were cauterized from the lower border of the 2nd rib to the 4th rib. Three to four cm lateral to the rib necks, the branches of the nerve of Kuntz, were also cauterized. CO_2 gas was removed as much as possible to avoid CO_2 pneumothorax.

Patients were evaluated twice; once before the procedure and once one month after the procedure. Evaluations included the sites of hyperhidrosis, HDSS score, and QoL. Patients' satisfaction, compensatory hyperhidrosis, and procedural complications such as pneumothorax were also assessed upon follow-up.

The HDSS has four statements scored 1-4 and individuals can only mark one of these statements. A score of 1 or 2 shows mild to moderate hyperhidrosis, while a score of 3 or 4 indicates severe hyperhidrosis (13). We evaluated the Persian version of HDSS in a pilot study and found an internal consistency of 0.85 as well as Cronbach's alpha of 0.93. QoL was evaluated using a 20-item questionnaire first developed by Amir and colleagues (14). It consists of four domains, including personal, emotional, functional-social, and special conditions, with scores ranging from 20 to 100 and higher scores indicating worse QoL. We also evaluated the reliability and validity of the Persian version of this QoL questionnaire and found an internal consistency of 0.81 as well as Cronbach's alpha of 0.91. Patients' satisfaction with ETS was assessed using a four-choice item based on their personal judgement. The answers were 100%, 90%, 75%, and < 50% satisfied with the procedure.

Data analysis

We used the Statistical Package for the Social Sciences (SPSS) software (version 26.0, Armonk, NY: IBM Corp.) for data analysis. Means and standard deviations were used to describe quantitative variables, and frequencies and percentages for qualitative variables. Chi-square test was used to compare qualitative variables before the procedure and at follow-up. Based on the results of Kolmogorov-Smirnov normality test, paired *t* test was used to compare quantitative variables before and after the procedure. $P \leq 0.05$ were considered statistically significant.

Results

From the 47 patients included in this study (mean ± SD age = 28.2 ± 1.21 years), 27 (57.4%) were men and 20 (42.6%) were women (Table 1). The patients' QoL improved significantly and HDSS score significantly decreased on follow-up compared with baseline ($P < 0.001$). Also, there was a significant reduction in the number of hyperhidrosis sites on follow-up ($P = 0.006$) (Table 2).

Compensatory hyperhidrosis occurred in none of the patients and there were no procedural complications. As for patients' satisfaction with the procedure, 45 (95.7%) were 100% satisfied and 2 (4.3%) were 90% satisfied.

Discussion

In the current study we found that ETS significantly improved the QoL of patients with primary hyperhidrosis. Also, all patients were 90%-100% satisfied with the

Table 1. General Characteristics of the Study Population

Variables	Total (n = 47)
Gender, No. (%)	
Male	27 (57.4)
Female	20 (42.6)
Age (y), mean ± SD	28.2 ± 1.21
BMI (kg/m^2), mean ± SD	23.82 ± 1.05

Abbreviations: N, number; SD, standard deviation; BMI, body mass index

Table 2. Comparison of Sites of Hyperhidrosis, HDSS, and QoL Before and After the Procedure

Variables	Before	After	*P* Value*
Number of hyperhidrosis sites, mean ± SD	2.01 ± 0.21	0.12 ± 0.04	0.006
HDSS, mean ± SD	3.78 ± 0.45	1.54 ± 0.22	<0.001
QoL, mean ± SD	82.48 ± 8.26	32.44 ± 5.87	<0.001

Abbreviations: SD, standard deviation; HDSS, Hyperhidrosis Disease Severity Scale; QoL, quality of life.
*Analyzed by paired *t* test.

procedure. Additionally, ETS significantly reduced the number of hyperhidrosis sites and HDSS in these patients after one month compared with the baseline. Furthermore, no cases of compensatory hyperhidrosis were reported by any of the patients after the procedure.

Vannucci and Araujo performed sympathectomies on 739 patients. Similar to our findings 95.9% of the patients were very satisfied with the procedure 30 days after surgery; nevertheless, they reported a slight insignificant decrease in the patients' satisfaction over two years after surgery (12). This shows that patients undergoing ETS should be followed up for a longer period to better evaluate satisfaction with the procedure.

We had no cases of compensatory hyperhidrosis in our patients. In a meta-analysis of eight randomized trials including 1200 patients undergoing video-assisted thoracoscopic sympathectomy for palmar hyperhidrosis, the risk of compensatory hyperhidrosis was lower with sympathectomy at lower segments compared to higher segments (15). Zhang and colleagues demonstrated comparable results in their meta-analysis of 10 articles consisting of 1195 patients (16). The inclusion of patients with different sites of hyperhidrosis, as well as the relatively small number of patients evaluated in our study can be responsible for the difference between the results of these two studies and ours.

Wolosker and colleagues reported compensatory hyperhidrosis in less than 10% of their patients after ETS (17). ETS is primarily performed on non-obese patients as obesity puts patients at a higher risk of compensatory hyperhidrosis (18). Nonetheless, the mean BMI of the patients in the mentioned study was 21.6 kg/m^2 while the mean BMI of our patients was 23.82 kg/m^2. Factors other than BMI, such as the level at which sympathectomy was performed and the severity of hyperhidrosis before the procedure in the two studies could be the potential explanations for this discrepancy.

In line with our findings regarding the significant improvement in the QoL, Wolosker and colleagues found improved QoL in their study irrespective of the number of hyperhidrosis sites (17). QoL improvement after surgery reflects surgical success (19). Patients' satisfaction is another index to evaluate surgical success. Consistent with our results, Wolosker et al reported that more than 90% of the patients were very satisfied with the procedure; however, 2.6% of their patients had < 50% satisfaction. All our patients had 90%-100% satisfaction with ETS. One reason for this can be the occurrence of compensatory hyperhidrosis in some patients in that study compared with none in ours. Compensatory hyperhidrosis can produce personal and social disorders for the patients leading to lower QoL compared to the QoL associated with their main complaint (20-23).

Our study was not without limitations. A limitation of the current study was the small sample size which can affect the generalizability of the results. Also, our study was single-centered. Future studies with a larger sample size are required to confirm our findings.

Conclusion

In general, ETS can be very effective for the treatment of patients with hyperhidrosis because it can significantly improve their QoL. Furthermore, ETS appears to be a safe procedure with no or minimal procedural complications. However, long-term follow-up of patients can determine the recurrence rate and the occurrence of complications.

Authors' Contribution

Conceptualization and study validation: SHeB. Study supervision: AF. Implementation: SHeB. Data analysis and interpretation: SHaB. Writing and reviewing: SHeB. All the authors have read and approved the manuscript.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available upon request.

Ethics Approval

The study received ethics approval from the Ethics Committee of Hormozgan University of Medical Sciences and it complies with the statements of the Declaration of Helsinki. Written informed consent was obtained from the parents/guardians of all patients.

Conflict of Interests

The authors declare that they have no competing interests.

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