

The Results of a Long-Term Follow-up of Bilateral Single Port Sympathectomy in Primary Hyperhidrosis: Should We Perform This Surgery?

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Abstract

Background: Hyperhidrosis (HH), which refers to excessive sweating of the body in response to temperature or emotional stimuli rather than physiological stimuli, can adversely affect quality of life. In this prospective study, we investigated the long-term effects, development of complications, and patient satisfaction among those who underwent bilateral single-port endoscopic thoracic sympathectomy (ETS) for HH.

Methods: Thirty-one patients who underwent bilateral single-port endoscopic thoracic sympathectomy (ETS) for HH between January 200 and November 2014 were enrolled in this study. The patients were followed up until July 2017. Patient satisfaction in terms of the primary complaint (PC) and complications, such as compensatory hyperhidrosis (CH), in the short and long term were recorded.

Results: The mean follow-up period was 60.6 ± 12.8 (min: 40, max: 89) mo postoperatively. When both the short- and long-term results were evaluated together, CH had no effect on patient satisfaction. However, persistence of the PC in both the short ($p = 0.020$) and long term ($p = 0.001$) had a significant effect on satisfaction.

Conclusion: The most important factor affecting patient satisfaction was PC persistence. Thus, further studies should be performed to enlighten this complication, even though it may remit with time. Whether ETS is a permanent treatment that cannot successfully treat PC, possible complications and the ability to cope with them will seem to be open to debate as the most important issues that surgeons will have to face in the near future.

Keywords: Complication; hyperhidrosis; surgery; sympathectomy

INTRODUCTION

Hyperhidrosis (HH) can be described as excessive sweating of the body that exceeds physiological needs [1]. Hyperhidrosis may be primary or secondary. Primary HH is the result of overactivity of the sympathetic nervous system, whereas secondary HH is caused by various factors, such as malignancies, endocrine disorders (e.g., thyrotoxicosis), and some medications [1-3]. Primary HH affects facial, palmar, axillary, and plantar regions of the body, exhibiting regional and symmetrical involvement patterns due to sympathetic nervous system overactivity [1,2].

Hyperhidrosis may be treated via medical or surgical ap-

proaches. Endoscopic thoracic sympathectomy (ETS) is the most commonly used type of surgical treatment today. The surgery can be performed in a variety of ways, such as dissecting the sympathetic chain in the thoracic region, thermal damage via electrocautery, or clipping. Among various ETS-related complications, which include a hemo-pneumothorax, Horner's syndrome, and bradycardia, the most important in terms of both patient and physician satisfaction is compensatory hyperhidrosis (CH) [4,5].

In this prospective study, we investigated the rate of complications, such as CH, and PC persistence in the long-term postoperative period following bilateral single port ETS and the effects of these complications on patient satisfaction.

METHODS

Patients who had undergone single port ETS between January 2010 and November 2014 at Çanakkale Onsekiz Mart University Medical Faculty Thoracic Surgery Clinic were prospectively followed up until July 2017. During outpatient clinical examinations and telephone inter-

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views, the patients were questioned about changes in CH and their PC in the postoperative period and their satisfaction with the operation.

In the 6 mo prior to the single port ETS, all the patients had received medical treatment. Despite this treatment, none of the patients experienced improvements in their PC. Prior to surgery, informed consent was obtained from each patient. In patients with HH affecting multiple areas, only the area most affected was treated. The ETS was performed using a 10-mm 0-degree thoracoscope (Karl Storz 26034 AA) with a 6-mm working channel under general anesthesia via a double-lumen endotracheal tube. After the patient had been positioned in the lateral decubitus position, a single thoracoport (width: 10.5 mm) was inserted into the thorax through a single incision of 11 mm at the intersection of the fourth intercostal space and mid-axillary line (Figure 1). The sympathetic chain was cauterized by endoscopic electrocautery from the T2 for fascial hyperhidrosis, T3 for palmar hyperhidrosis, T4 for axillary hyperhidrosis, and T5 for plantar hyperhidrosis. In addition, during the sympathectomy of the T2-T3, the presence of the nerve of Kuntz was verified, and the nerve tissue was cauterized. The rib bed was cauterized laterally for an additional 2 cm to allow the dissection of possible bypassing nerve fibers. After hemorrhage control, the air in the pleural cavity was evacuated via a small catheter. The incision line was closed by subcutaneous suturing, and the same procedure was repeated on the other side. On the postoperative first day, the patients were evaluated by a physical examination, posterior-anterior chest X-ray, hemogram, and blood biochemistry tests. Patients whose physical examination and examination results revealed no abnormalities were discharged from the hospital on the first postoperative day. The patients were referred to the outpatient clinic on the seventh postoperative day and reevaluated via a physical examination and posterior-anterior chest X-ray. In the third postoperative month and again in the third postoperative year, all the patients were interviewed by telephone. They were questioned about their HH status, CH status, and satisfaction with the operation. They were asked to rate their HH at the site of the PC from 0 to 10, where 0 represented no sweating, and 10 represented the most severe sweating.

The follow-up times were from the date of the operation to the last follow-up date (July 2017), expressed in months. Subsequently, cutoff values at 48, 60, and 72 mo were coded as a dichotomous variable for those below and above the follow-up period. The following parameters were coded as dichotomous variables: CH, PC, and patient satisfaction. In terms of the latter, on the day of the interview, the patients were asked whether, given the choice, they would undergo the surgery again. The



Figure 1. Thoracoscope Insertion Through Single Port Incision.

CH and PC intensities were coded as continuous variables ranging from 1 to 10.

The data were then transferred to a digital medium. The normal distribution matching of the continuous variables was examined for the frequency and distribution of variables. The relations between the continuous variables were analyzed using appropriate correlation tests, and the relations between the dichotomous variables were analyzed using a chi-square test and, if necessary, Fisher's exact test. In all the analyses, statistical significance was accepted as a p-value of < 0.05 . The absolute p values are given for the analysis results.

RESULTS

Thirty-one patients who underwent bilateral single port ETS at Çanakkale Onsekiz Mart University Medical Faculty Chest Surgery Clinic between January 2010 and November 2014 were included in the study. Sixteen (51.6%) of the patients were males, and 15 (48.4%) were females. The mean age of the patients was 24.13 ± 4.64 (min: 13, max: 34) y. In terms of the site of the PC, it was craniofacial in 6.5% ($n = 2$) of cases, palmar-facial in 12.9% ($n = 4$) of cases, palmar in 67.7% ($n = 21$) of cases, axillary in 9.7% ($n = 3$) of cases, and palmoplantar in 3.2% ($n = 1$) of cases.

The postoperative complications were a pneumothorax in one patient and a hemopneumothorax in one patient. Tube thoracostomy was performed in the patient who developed a hemopneumothorax, and air evacuation via thoracentesis was performed in the other patient. All the other patients were discharged on the first postoperative day. Thus, the average duration of the hospital stay was 1.13 ± 0.56 (min: 1, max: 4) d. The mean follow-up period was 60.6 ± 12.8 (min: 40, max: 89) mo postoperatively.

When the patients were questioned about their PC status, 10 (32.3%) of the 31 patients responded that their

Table 1. Regional Distribution of Ongoing Hyperhidroses.

Region	n	%
Craniofacial	1	10
Palmar	5	50
Axillary	3	30
Plantar	1	10
Total	10	100

Table 2. The Distribution of the Severity of Compensatory Hyperhidrosis.

Severity	n	%
3	1	6.8
4	2	13.3
5	2	13.3
6	2	13.3
7	3	20
8	3	20
10	2	13.3
Total	15	100

Table 3. The Regional Distribution of Compensatory Hyperhidrosis.

Location	n	%
Dorsal	9	60
Abdomen	3	20
Chest	3	20
Total	15	100

PC was not resolved. The remaining 21 cases responded that their PC was in remission. Among patients with a persistent PC, the most frequent site was palmar HH (Table 1).

When the patients were asked about their CH status in the postoperative third-month, 15 (48.4%) of the 31 patients reported that they had developed CH. When questioned about the severity of the CH, the severity ranged from 3–10, with the most frequent CH site being the dorsal region (Tables 2 and 3).

At the time of the final interview in July 2017, the patients were questioned about their satisfaction with the surgery. Six (19%) of the 31 patients were dissatisfied with the surgery, and 81% of patients were satisfied. Five of the six (83%) patients who were not satisfied with the surgery had developed CH, and the PC was unresolved in five of these six (83%) cases (Tables 4, 5). In total, seven patients indicated that if given the choice today, they would not have the surgery. Two of these seven patients developed CH postsurgery, and the PC was unresolved in the other five cases. One patient who was satisfied with the surgery reported that he would not undergo this surgery today. This patient had some relief from his PC, but it was not completely resolved.

Table 4. Primary Complaint versus a Satisfaction Cross Table.

	Primary complaint		Total
	-	+	
Satisfaction			
No	1	5	6
Yes	20	5	25
Total	21	10	31

* $p > 0.05$, Fisher's exact test value 0.007.

Table 5. Compensatory Hyperhidrosis versus a Satisfaction.

	Compensatory Hyperhidrosis		Total
	-	+	
Satisfaction			
No	1	5	6
Yes	15	10	25
Total	16	15	31

* $p > 0.05$, Fisher's exact test value 0.083.

When the long-term follow-up of the cases was examined, the PC was resolved in two patients, and CH developed in three patients. In total, there were 8 (25%) cases of PC persistence and 18 (58%) cases of CH persistence. Persistence of the PC affected patient satisfaction in both the short ($p = 0.007$) and long term ($p = 0.001$). In contrast, CH had no effect on patient satisfaction in either the short ($p = 0.083$) or long term ($p = 0.359$).

DISCUSSION

Although the precise pathophysiological mechanism in HH is not known, excessive stimulation of thermoregulatory and emotional sweating control centers or excessive secretion of acetylcholine by the sympathetic nervous system in response to stimulation of these centers may play a role [3]. Individuals with primary HH, which usually begins in childhood or adolescence, generally consult a physician because of psychosocial problems caused by HH [6].

Medical therapy options for HH include topical or systemic antiperspirants, iontophoresis, botulinum toxin injections, laser therapy, and microwave therapy [6]. Topical antiperspirant agents consist of a 20% solution of aluminum hydrochloride [7]. Topical and systemic forms of anticholinergics include glycopyrrolate and oxybutynin [7]. Iontophoresis is the treatment of choice for palmoplantar HH. The treatment is based on the principle that the palmoplantar zone is kept in tap water in which a low voltage electrical current is applied for about 30 min [8,9]. Botulinum toxin A injections are used as a treatment for both palmoplantar and axillary HH. These provide a longer remission time than any other medical treatment, with remission of HH for about 6 mo

post-treatment^[10]. In terms of laser treatment, a neodymium yttrium aluminum garnet laser is used for HH^[11]. In microwave therapy, thermolysis of eccrine sweat glands is conducted. The main difference of this method is that it is irreversible^[12]. The main disadvantage of medical treatments for HH as compared to surgical treatment is that medical therapy offers only a temporary solution to an ongoing problem, and the treatments have to be repeated. An important advantage of medical therapy versus surgical treatment is the absence of CH, which is a complication of surgery. For this reason, all HH patients are advised to receive medical treatment for at least 6 mo before considering surgery. If the medical treatment is unsuccessful, with success defined as patient satisfaction, surgery is an option. In the present study, none of the patients had satisfactory outcomes prior to undergoing surgery.

CH, a complication of ETS, refers to excessive sweating affecting various parts of the body. The mechanism underlying the development of CH is not known. Although some authors have argued that this condition develops because of negative feedback stimuli of the sympathetic chain cannot reach the hypothalamus, there is no scientific evidence to support this hypothesis^[13,14]. Approximately 3–98% of patients develop CH after ETS, and it is most commonly observed in the trunk area. It is not possible to predict who may develop CH and how severe it may become^[4,5,13,15]. Although some studies showed that a sympathectomy at the T2 level or a sympathectomy at multiple levels and older age increased the risk of developing CH, other studies contradicted these findings^[13,16–18]. In our study, in the short term, the rate of CH was 48%, whereas it was 58% in the long term. CH developed most commonly in the trunk region, similar to the scientific literature on this subject.

Previous research reported that the development of CH and PC persistence were the two most important factors affecting patient satisfaction after ETS operations. In the literature, the reported rates of PC persistence range from 0 to 21.4%^[13,17,19]. The rates in the present study were comparable to those found in the literature, with rates of 32% in the short-term follow up and 25% in the long-term follow up. An interesting finding in the present study was that PC persistence was the most important factor affecting patient satisfaction in the long term.

In previous studies on HH, the postoperative follow-up period was less than 1 y, with most follow-ups lasting approximately 6 mo. Thus, knowledge is limited on the status of HH among these patients over the long term. In the present study, the patients were followed up for a mean of 60 mo. As shown by the results, an increase in the rate of CH did not increase patient satisfaction. In contrast, while a decrease in PC was observed, there was

also a decrease in the patient satisfaction. Thus, the most important factor affecting patient satisfaction was continuation of the PC in contrast to our current knowledge. According to a previous study, the results of intermittent unilateral ETS for reducing CH, which affects patient satisfaction in the short term, are promising, although the duration of the follow-up in the study was only 1 y^[20]. However, the hospital costs associated with intermittent unilateral ETS seem to be disadvantages, with the procedure requiring two surgeries, two anesthesia sessions, and two hospitalizations. We believe that the primary goal of surgery should be complete resolution of the PC. Self-remission of the PC with age should also be seen as a disadvantage for the ETS^[21]. The possibility that the PC may regress in time, combined with the fact that PC persistence rather than CH affects patient satisfaction, casts doubts on the feasibility of ETS for HH.

The present study has some limitations. The number of cases (N = 31) may be considered low as compared with that in other studies on ETS. In addition, we did not compare the ETS method with medical treatment methods in terms of patient satisfaction. Furthermore, we did not use standardized questionnaires to assess quality of life and patient satisfaction with ETS. Thus, the answers we obtained in our interviews may be considered “subjective.” As with all forms of “satisfaction,” the term “patient satisfaction” is subjective. The development of standardized questionnaires on quality of life and patient satisfaction with ETS would improve the objectivity of patient responses.

CONCLUSION

For HH, ETS is the only treatment that has been proven to be successful in the long term. The two most important factors affecting patient satisfaction after ETS are the continuation of the PC and CH. Intermittent unilateral ETS may be considered an alternative surgical approach for CH, although the likelihood of CH may increase in the long term. Furthermore, the PC of HH may regress with age. This treatment should be described as temporary (at least until the end of the adolescence period) rather than permanent. The decision whether to perform this surgery is up to the surgeon. However, the decision whether to be treated with surgery for HH should be the patients after all these data have been conveyed.

DECLARATIONS

Authors' contributions

Made substantial contributions to conception and design of the study and performed data analysis and interpretation: Alar T and Gedik İ E.

Performed data acquisition, as well as provided administrative, technical, and material support: Alar T and

Gedik İ E.

Conflicts of interest

All authors declare that there are no conflicts of interest.

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