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An assessment of anxiety in patients with primary hyperhidrosis before and after endoscopic thoracic sympathicolysis

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Abstract

Objective: Endoscopic bilateral thoracic sympathicolysis (EBTS) is an effective and minimally invasive procedure used for patients with primary hyperhidrosis. The purpose of this study was to examine anxiety levels using standardized psychometric tools in hyperhidrosis patients before and after EBTS. **Methods:** A total of 106 patients diagnosed with hyperhidrosis who underwent EBTS were asked to fill out a questionnaire before and 12 months after the procedure that elicited the following information: (a) symptoms associated with hyperhidrosis; (b) the patient's level of anxiety; and (c) the extent to which this anxiety was incapacitating in their daily life. All patients also completed State–Trait Anxiety Inventory (STAI) before and 12 months after the EBTS. **Results:** Palpitations were reported preoperatively by 40% of patients versus 10% postoperatively, trembling of the hands in 24% versus 8%, facial blushing in 55% versus 11%, headache in 29% versus 9%, and non-specific epigastric pain in 19% versus 7%. Patients reported a marked improvement in the level of anxiety from a mean SD of 2.08 ± 1.1 preoperatively versus 0.39 ± 0.67 postoperatively ($p < 0.001$), and the social impact (debilitating) of primary hyperhidrosis before and after surgery also showed significant improvement ($p < 0.001$). The results of STAI showed significant improvement in the levels of anxiety after surgery compared with the preoperative levels and with established norms ($p < 0.001$). **Conclusions:** Patients with primary hyperhidrosis that undergo EBTS presented a decrease in the level of anxiety and associated symptoms.
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Keywords: Hyperhidrosis; Sympathicolysis; STAI; anxiety

1. Introduction

Primary hyperhidrosis (PH) is a rare disorder of unknown etiology that is characterized by excessive sweating on the palms of the hands, the soles of the feet, in the armpits (axillary), in the groin area, and/or under the breasts [1]. It is different from secondary hyperhidrosis, which occurs as a consequence of another disorder. According to scientific literature, primary hyperhidrosis has an incidence of up to 1%, and the most widely currently applied treatment is surgery, which has been demonstrated to achieve the best outcome [2–6]. The surgical procedure, endoscopic bilateral thoracic sympathicolysis (EBTS), is a simple, fast, effective and minimally invasive treatment [7,8].

Excessive sweating, usually in the hands, is the principal sign of hyperhidrosis, which is also accompanied by a high degree of anxiety and sympathetic hyperactivity. These clinical symptoms have led hyperhidrosis to be considered a sign of psychiatric disorder [9,10] and studies assert that patients with primary hyperhidrosis are anxiety-ridden individuals [11].

The PH patients report a high degree of anxiety that is debilitating to their daily life. This anxiety is not reflected as increased state or trait anxiety compared to the general population, consistent with recent studies that rule out underlying psychiatric disease in such patients [12,13].

The purpose of this review of a prospectively gathered database was to examine anxiety levels of patients referred for surgical treatment. The anxiety levels were measured using standardized psychometric tests to assess the response in patients before and after treatment.

2. Materials and methods

The sample included 112 patients with primary palmar, axillary, and/or facial hyperhidrosis that underwent

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Table 1
Scale used to assess level of anxiety and degree to which this anxiety was debilitating

"Indicate the level of anxiety you perceive caused by hyperhidrosis and the accompanying symptoms"

0_____1_____2_____3_____4
None Low Moderate High Extremely high

I perceive this anxiety to be

0_____ 1_____2_____3_____4
Not at all debilitating Quite debilitating Extremely debilitating

endoscopic bilateral thoracic sympathicolysis. This study was approved by the Ethics Committee at our hospital (equivalent to the Institutional Review Board in the USA). Information about the technique, results and side effects were provided to patients in a written format during the first consultation. An individual consent was obtained prior to the surgery.

All patients underwent the same preoperative study, consisting of clinical history, simple chest X-ray, ECG, complete hemogram, general biochemistry with coagulation parameters, determination of thyroid function and simple spirometry; those patients with a history of asthma were also measured bronchial reactivity by means of a metacholine provocation test in order to establish possible variations of their responsiveness, and in the event that the test was positive, were treated with inhaled corticoids two months prior to the surgery.

Eight weeks before intervention, all patients underwent appropriate preoperative testing and filled out a questionnaire that elicited the following information: (a) symptoms associated with hyperhidrosis; (b) the patients' level of anxiety; (c) the extent to which this anxiety was incapacitating, both assessed by a visual analog scale (VAS) graded between 0 (none anxiety/not at all debilitating) and 4 (extremely high anxiety/extremely debilitating) (Table 1) and the State—Trait Anxiety Inventory (STAI) [14].

Visual analog scale is one of the most frequently used measurement scales in health care research. Although VAS is most commonly known and used for measurement of pain, it is adaptable for the measurement of a variety of stimuli, including anxiety. It measures the intensity or magnitude of sensations and subjective feelings, and the relative strength of attitudes and opinions about this specific stimuli (in this study, anxiety). Patients were asked to rate their anxiety from 0 (none) to 4 (extremely high) as well as describe the level to which this anxiety was debilitating to their daily life, starting from 0 (not at all debilitating) to 4 (extremely debilitating) (Table 1).

The STAI is a technique that includes separate self-administered questionnaire used to measure two independent concepts of anxiety: state and trait. While state anxiety is considered a transitory emotional condition with changing intensity as a reaction to environmental stimuli, trait anxiety is defined as a relatively stable tendency towards anxiety. A version of the STAI for the Spanish population was reported in 1982 [15].

STAI consists of 40 questions divided into two groups, 20 questions regarding state anxiety (SA) and 20 questions regarding trait anxiety (TA). Representative items include statements such as 'I feel nervous', 'I feel worried', 'I am relaxed' or 'I am jittery' and 'I feel frightened'. Version of the STAI for the Spanish population uses a four-point scale (very much so: 3; moderately so: 2; somewhat: 1; and not at all: 0) and is scored from a minimum of 0 to a maximum of 60 on each scale. In normal adults, reference values (mean $\pm$ SD) are 21.92 ± 11.24 for STAI state and 22.59 ± 9.47 for STAI trait.

Twelve months after the surgery the patients completed another questionnaire to record: (a) associated symptoms to hyperhidrosis after the surgery; (b) the patients' level of anxiety; (c) the extent to which this anxiety was incapacitating; (d) the State—Trait Anxiety Inventory; (e) satisfaction or dissatisfaction within the surgery; and (f) presence of compensatory sweating.

3. Endoscopic thoracic sympathicolysis

The surgical protocol was carried out as following: (a) general anesthesia with double-lumen endotracheal intubation, placing the patient in a 25° sitting position with abduction of the upper extremities and semi-extension of the forearms; (b) lateralization of the table about 10° toward the opposite side of the hemithorax being operated on and creation of a single entry port for the 5 mm Wolf® endoscope (5.5/3.5 mm 0°; Richard Ellis Wolf, University of Leipzig) at the level of the III intercostal space—axillary midline; (c) the rib spaces and corresponding segment of the upper thoracic sympathetic chain were then visualized, located 0.5—1 cm laterally from the head of the rib and application of sympathicolysis to the T2—T3 ganglia in palmar and to T2—T3—T4 in axillary hyperhidrosis patients, respectively, by means of electrocoagulation with monopolar forceps at 25 W in series of 5—10 applications cutting the chain at the level of the ribs; (d) collateral nervous trunks were coagulated (nerve of Kuntz); (e) hemostasia and evacuation of the pneumothorax by means of air aspiration through the endoscopic working channel, no drain left; and (f) discharge of patients 17 h after the intervention if X-rays were correct.

4. Statistical analyses

The data were analyzed using the SPSS 11.0 Statistical Software Package (SPSS; Chicago, IL, USA). Using Kolmogorov—Smirnov test, the distribution of the variables

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Table 2
Changes in anxiety levels and degree to which this anxiety was debilitating before endoscopic thoracic sympathicolysis and at the 12-month follow-up

	Preoperative (N = 106) Mean ± SD	Postoperative (N = 106) Mean ± SD	p-value
Anxiety level	2.08 ± 1.10	0.39 ± 0.67	<0.001
Debilitating	2.06 ± 1.08	0.34 ± 0.66	<0.001

was evaluated; following a nonnormal distribution ($p < 0.05$) so nonparametric test were used. All quantitative results preoperative and postoperative were compared using Wilcoxon signed rank test. The Wilcoxon signed rank was used to analyze the difference between pretreatment and posttreatment STAI scores for all patients, and the Mann–Whitney U-test was used to compare established norms. MacNemar test was used to analyze the differences between pretreatment and posttreatment symptoms accompanying hyperhidrosis. Changes were deemed statistically significant at a level of $p < 0.05$.

5. Results

The study population consisted of 112 patients, of which 6 were lost to follow-up. The response rate for the questionnaire was 106 patients (94.6%), of which 76 women (72%) and 30 men (28%), with an average age of 28.4 years (range, 17–55 years).

Table 2 shows the results of the anxiety levels or the accompanying signs and symptoms caused by hyperhidrosis. Patients reported a remarkable improvement in the level of anxiety from a mean SD of 2.08 ± 1.1 preoperatively versus 0.39 ± 0.67 ($p < 0.001$) postoperatively, the social impact of primary hyperhidrosis before and after surgery also demonstrated relevant reduction.

Palpitations were reported preoperatively by 42 patients (40%) versus 11 (10%) postoperatively ($p < 0.001$), trembling of the hands by 25 patients (24%) versus 9 (8%) postoperatively ($p = 0.002$), facial blushing by 58 (55%) versus 12 (11%) postoperatively ($p < 0.001$), headache by 31 (29%) versus 10 (9%) postoperatively ($p < 0.001$), and unspecific epigastric pain by 20 (19%) versus 7 (7%) postoperatively ($p = 0.007$).

Table 3 shows STAI scores. Prior to the surgery the patients' STAI scores were in the normal range when compared established scores for the general population, with no statistical differences between the groups on state and trait anxiety scores. Postoperatively, however, both trait and state anxiety were reduced significantly ($p < 0.001$) when compared with their preoperative levels (by Wilcoxon test) and with established norms (by Mann–Whitney U-test). Compensatory sweating was detected in 83 of the 106 patients, which represented 78% of patients operated. Importantly, only 15 patients felt impaired by compensatory sweating (10%).

Patient-reported degree of satisfaction after the surgery was as follows: 96 patients (90.6%) described themselves as very satisfied, 8 (8%) were quite satisfied, and 2 (2%) were unsatisfied.

6. Discussion

The etiology of primary hyperhidrosis is still unknown, and although basal sympathetic hyperactivity has been suggested as the cause based on the symptoms seen in PH patients, it can also be the result of the anxiety produced by hyperhidrosis. Previously postulated relationship between PH and psychopathology is contradicted by contemporary findings, which demonstrated that the two entities are not related [12]. In the present study, we observed a high degree of subjective anxiety and its influence on the daily life in patients with PH, even though this anxiety was not reflected by STAI results [13].

Following the surgical treatment, the level of anxiety and its influence on the daily life showed a statistically significant diminution that was reflected in the STAI scores. Before the surgical procedure, no differences were observed in the level of SA or TA when compared to general population, possibly because the STAI is not apt for measuring the preoperative anxiety of patients as long as they do not fulfill diagnostic criteria of generalized anxiety, however, the disorder was found to incapacitate their daily life.

After the surgery, coinciding with other reports in the literature, we observed a clear and significant diminution of the anxiety state, which can be explained by the elimination of the generating factor of anxiety [16]. Additionally, a decrease in TA score indicates that hyperhidrosis is an induction and maintenance factor of anxiety since it is detectible from the infancy in a long-term fashion. Interestingly, unlike the results of our study, Kumagai et al. [17] did not observe a significant decrease in the values of the postoperative STAI scores compared with the general population. These findings reinforce the belief that endoscopic thoracic sympathetic surgery is, mainly, a therapeutic symptomatic approach and an adjuvant therapy in the management of social anxiety [18,19].

In this study, a decrease in the associated symptoms was observed, possibly occurring as a result of the decrease in the anxiety or due to a decrease in sympathetic hyperactivity; the latter one is difficult to assure since no proper and

Table 3
Results of psychological tests

	Reference group (N = 660) Mean ± SD	Preoperative (N = 106) Mean ± SD	12 months (N = 106) Mean ± SD	p-value
Trait anxiety (TA)	22.59 ± 9.47	23.05 ± 10.12	16.94 ± 9.51[a]	<0.001
State anxiety (SA)	21.92 ± 11.24	22.42 ± 11.12	13.55 ± 9.00[a]	<0.001

N: number of patients.
[a] Postoperative versus preoperative and reference group.

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specific instrument is available to confirm such etiology. Although there is no physiopathological explanation to the headache experienced by patients with primary hyperhidrosis, we have detected a significant reduction of this symptom after the surgical intervention. The treatment of the migraine by means of thoracic sympathicolysis is described in the literature [20] as well as in cluster migraines when other therapeutic approaches have failed [21]. This observation prompts further investigation of other possible disorders that could be treated and/or alleviated with endoscopic thoracic sympathicolysis.

The high level of general satisfaction after the surgery might also have contributed to a decrease in the level of anxiety in patients with primary hyperhidrosis, in spite of displaying compensatory sweating. These results suggest that sympathetic hyperactivity conditions primary hyperhidrosis and its symptoms, altogether boosting-related anxiety.

We believe that STAI, although it is not a specific questionnaire for hyperhidrosis, can be useful as an evaluating tool of general response after the surgery since it includes multiple questions that affect the preoperative and postoperative status of the patient.

In conclusion, we observed that patients with PH submitted to EBTS presented a diminution of anxiety level stated both subjectively and in standardized psychometric tests, although the test was not specific for this particular disorder. We believe these findings contribute to the knowledge of this disorder and prompt further investigation in this line, since the decrease in anxiety has to be confirmed over a longer period of time. Additionally, there is still a need to identify proper research tools that would allow the measurement of basal sympathetic hyperactivity. To the best of our knowledge, this is the first study in the literature that registers the anxiety in patients with primary hyperhidrosis as a long-term outcome of the surgical intervention by means of a standardized psychometric evaluation.

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