Türk Göğüs Kalp Damar Cerrahisi Dergisi 2017;25(4):638-643
http://dx.doi.org/doi: 10.5606/tgkdc.dergisi.2017.13497

Original Article / Özgün Makale

The effect of micro-invasive endoscopic thoracic sympathectomy in palmar hyperhidrosis patients on quality of life and hyperhidrosis

Palmar hiperhidrozis hastalarında mikroinvaziv endoskopik torakal sempatektominin yaşam kalitesi ve hiperhidrozis üzerine etkisi

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ABSTRACT

Background: This study aims to evaluate the effect of micro-invasive endoscopic thoracic sympathectomy in primary palmar hyperhidrosis patients on the quality of life and hyperhidrosis.

Methods: Between March 2012 and May 2015, the data of 47 patients (27 males, 20 females; mean age mean age was 26.9±9.3 years; range 15 to 53 years) who underwent micro-invasive endoscopic thoracic sympathectomy due to primary palmar hyperhidrosis were retrospectively analyzed. Pre- and postoperative Perfusion Index values at five min, compensatory hyperhidrosis at six months, scar formation at the wound site at six months, and the Hyperhidrosis Disease Severity Scale and Quality of Life Questionnaire scores at one and six months were analyzed.

Results: The mean operation time was 27.5±5.6 min. The surgical success rate was 100%. The rate of compensatory hyperhidrosis was 36.2% at six months. While 45 patients (95.7%) did not experience pain in the incision site at six months, two patients (4.3%) complained of mild pain. With regard to scar formation at the wound site, 44 patients (93.6%) described the wound site as "very good" and three patients (6.4%) described it as "good" at six months. A statistically significant improvement was found at the postoperative first- and sixth-month Quality of Life scores, compared to the baseline scores ($p<0.001$).

Conclusion: Our study results showed an elevated risk of compensatory hyperhidrosis and severity with the increased age and symptom duration. Based on our study results, patients with a high-risk of compensatory hyperhidrosis can be detected with preoperative analyses, and different therapeutic options can be applied due to low patient satisfaction. We consider that endoscopic thoracic sympathectomy with a single incision less than 1 cm should be the standard intervention, as it is associated with minimal pain and scar development in eligible patients.

Keywords: Endoscopic thoracic sympathectomy; hyperhidrosis; micro-invasive; quality of life.

ÖZ

Amaç: Bu çalışmada primer palmar hiperhidrozis hastalarında mikroinvaziv endoskopik torakal sempatektominin yaşam kalitesi ve hiperhidrozis üzerine etkisi değerlendirildi.

Çalışma planı: Mart 2012 - Mayıs 2015 tarihleri arasında primer palmar hiperhidrozis nedeni ile mikroinvaziv endoskopik torakal sempatektomi yapılan 47 hastanın (27 erkek, 20 kadın; ort. yaş 26.9±9.3 yıl; dağılım 15-53 yıl) verileri retrospektif olarak incelendi. Ameliyat öncesi ve sonrası beşinci dakika Perfüzyon İndeks değerleri, altıncı ayda kompansatuar hiperhidrozis, altıncı ayda yara yerinde skar gelişimi ve birinci ve altıncı ayda Hiperhidrozis Hastalık Şiddeti Ölçeği ve Yaşam Kalitesi Anketi skorları değerlendirildi.

Bulgular: Ortalama ameliyat süresi 27.5±5.6 dk. idi. Cerrahi başarı oranı %100 idi. Kompansatuar hiperhidrozis oranı altıncı ayda %36.2 idi. Altıncı ayda 45 hastada (%95.7) insizyon yerinde ağrı hissetmez iken, iki hastada (%4.3) hafif ağrı yakınması var idi. Yara yerinde skar oluşumu açısından altıncı ayda 44 hasta (%93.6) yara yerini çok iyi tanımlar iken, üç hasta (%6.4) iyi olarak tanımladı. Ameliyat sonrasında birinci ve altıncı ay Yaşam Kalitesi skorlarında, başlangıç skorlarına kıyasla, istatistiksel olarak anlamlı bir düzelme saptandı ($p<0.001$).

Sonuç: Çalışma sonuçlarımız yaş ve semptom süresinin artması ile birlikte kompansatuar hiperhidrozis riskinin ve şiddetinin artığını gösterdi. Çalışma sonuçlarımıza göre, yüksek riskli kompansatuar hiperhidrozisli hastalar ameliyat öncesi analizler ile tespit edilebilir ve düşük hasta memnuniyeti nedeni ile farklı tedavi stratejileri uygulanabilir. Uygun hastalarda, 1 cm'den küçük tek kesi ile yapılan endoskopik torakal sempatektominin minimal ağrı ve skar gelişimi ile ilişkili olduğundan, standart girişim olması gerektiği görüşündeyiz.

Anahtar sözcükler: Endoskopik torakal sempatektomi; hiperhidrozis; mikroinvaziv; yaşam kalitesi.

Received: May 15, 2016 *Accepted:* August 08, 2016

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Cite this article as:
Karaçam V, Şanlı A, Tertemiz KC, Tasdöğen A. The effect of micro-invasive endoscopic thoracic sympathectomy in palmar hyperhidrosis patients on quality of life and hyperhidrosis. Turk Gogus Kalp Dama 2017;25(4):638-43.

Primary hyperhidrosis (PH) is a skin disease characterized by sweating more than required for the physiological thermoregulation.[1] It is usually seen in the palmar, axillary, plantar, or the facial regions. The incidence of PH is between 1 and 3%, depending on the culture and the climatic conditions.[2,3] Palmar symptoms often begin in early childhood, axillary symptoms in adolescence, and craniofacial symptoms in adulthood.[4]

Although PH can be treated medically, endoscopic thoracic sympathectomy (ETS) is the most effective treatment.[4] However, there is no consensus on the technique to be applied, as cutting, cauterization, or clipping the sympathetic chain or ganglion can yield similar results with regard to the success of the procedure, patient satisfaction, and side effects.[5-8] The standard intervention is to cut the sympathetic chain by entering from the axilla through two or three ports. Recently, approaches through a trans-umbilical[9] or trans-areolar incision using a flexible endoscope have been reported for less scar and pain.[10] Of note, each method has some advantages and disadvantages.

In this study, we aimed to compare the newly developed techniques and the micro-invasive uniportal ETS operations. We also aimed to evaluate the patients with developing severe compensatory hyperhidrosis (CH) following ETS using preoperative tests such as hyperhidrosis-specific assessments scales.

PATIENTS AND METHODS

A total of 47 patients (27 males, 20 females; mean age 26.9±9.3 years; range 15 to 53 years) who underwent ETS due to primary palmar hyperhidrosis (PPH) between March 2012 and May 2015 were included in the study. The QoL questionnaire developed by De Campos,[11] data collection forms recommended by Cerfolio et al.,[2] and Hyperhidrosis Severity Scale (HDSS)[3] were used for standardization of the data. The pre- and postoperative first and sixth month data were evaluated retrospectively. All patients received conservative treatment for PPH and they underwent ETS voluntarily. Patients who had only facial hyperhidrosis and/or flushing, and only axillary hyperhidrosis were excluded from the study. Chest X-ray, electrocardiography, and routine blood tests were performed preoperatively. Surgery was recommended for the patients whose QoL questionnaire yielded poor or very poor results, as defined as a QoL score of >68.

The study protocol was approved by the Dokuz Eylül Üniversity Medical Faculty Ethics Committee. A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Surgical technique

All procedures were performed under general anesthesia using a double-lumen tube and by a single thoracic surgeon. The patients were positioned in the semi-seated position and the arms in 90 degrees of abduction. The perfusion index (PI) was measured from the index finger of both hands. A 5 mm skin incision at the anterior axillary line crossed the third intercostal space was performed (Figure 1). A 5.5 mm port (Versaport™, Covidien, Mansfield, MA, USA) was inserted, and the intrapleural space was visualized with a telescope (5.5 mm width, 50 cm length, 0°, Hopkins Telescope, Karl Storz GmbH & Co.KG, Tuttlingen, Germany). The port was slide out over the telescope to avoid nerve compression. The cautery-linked endo-dissector (Endo Dissect™, Covidien, Mansfield, MA, USA) was directed to the thorax under the guidance of the telescope (Figure 2). In all patients, the third and fourth sympathetic chain (R3-4) and the potential Kuntz nerve field were transected with the endo-dissector. The PI was re-checked at 5 min of the procedure. If the PI elevated by more than 50%, the procedure was accepted as successful.[12] A fine catheter was applied for underwater drainage and, then, the patient was ventilated with high positive pressure. The catheter was taken out following the end of air drainage. The skin was closed with tissue adhesives (Figure 3). The same procedure was performed for the contralateral side. The control chest X-ray was performed at the postoperative fourth to sixth hour, and patients were discharged, if pneumothorax did not develop.

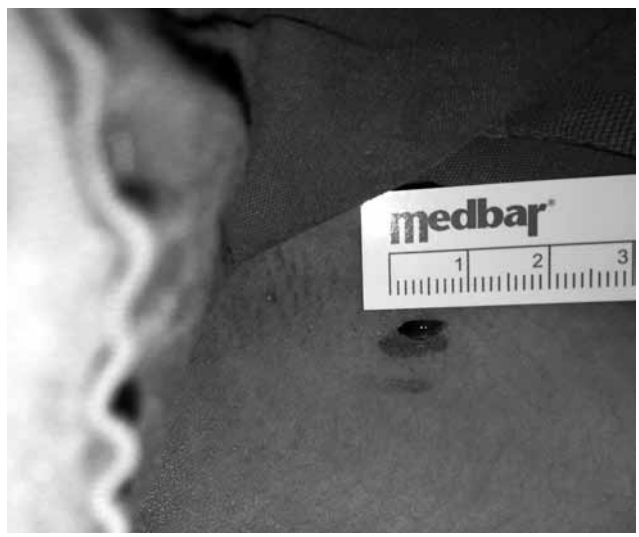

Figure 1. Skin incision less than 1 cm.

Figure 2. Telescope and endo-dissector is inserted into the chest on the same axis.

Figure 3. Postoperative wound closure with tissue adhesive.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 22.0 software(IBM Corp., Armonk, NY, USA). The descriptive data were expressed in mean and standard deviation (SD). The categorical variables were expressed in the number of cases and percentage. The Student t-test and Mann-Whitney U test were used depending on the data dispersion. A p value <0.05 was considered statistically significant.

RESULTS

Of a total of 47 patients, the mean height was 172.7±7.1 (range, 166 to 184) cm, the mean weight was 71.5±12.2 (range, 51 to 98) kg, and the mean body mass index (BMI) was 23.7±2.7 (range, 18 to 30) kg/m^2. Symptoms began in childhood in nine patients (19.2%), in adolescents in 26 patients (55.3%), and in adulthood in 12 patients (25.5%). The mean time from the onset of hyperhidrosis to ETS operation was 10.9±8.0 (range, 2 to 35) years. There was a family history of hyperhidrosis in seven patients (14.8%).

The mean operation time was 27.5±5.6 (range, 25 to 35) min. The preoperative and 5 min PI values are shown in Table 1. Accordingly, the 5 min. PI value increased by 332% in the right hand and 326% in the left hand, indicating a statistically significant difference (p<0.001). None of the patients developed intraoperative complications; however, minimal residual pneumothorax was found in two patients postoperatively, which was treated with oxygen therapy. The mean length of hospital stay was 1.08±0.35 (range, 1 to 3) days.

A significant improvement was observed, when the preoperative QoL scores (83.0±8.1) and postoperative first- (32.4±17.5) and sixth- (29.5±14.8) month QoL scores were compared (p<0.001). Similarly, at six months, the QoL scores were improved according to the first month (p<0.001). The mean pre- and postoperative first- and sixth-month values according to the HDSS were 3.7±0.4, 1.34±0.6, and 1.34±0.6, respectively. In addition, a significant improvement was found in the postoperative first- and sixth-month scores, compared to baseline scores (p<0.001 for each), although there was no significant difference between the postoperative first- and sixth-month scores (p>0.05).

Table 1. Pre- and postoperative 5 min Perfusion Index values from left and right hands

	Preoperative	Postoperative 5 min	
	Mean±SD	Mean±SD	p
Right hand Perfusion Index value	1.2±0.6	4.0±0.7	<0.001
Left hand Perfusion Index value	1.3±0.4	4.2±0.6	<0.001

SD: Standard deviation

Table 2. Relationship with compensatory hyperhidrosis and clinical features, Hyperhidrosis Disease Severity Scale and Quality of Life Questionnaire scores of patients

	First month control					Sixth month control				
	CH+		CH-			CH+		CH-		
	n	Mean±SD	n	Mean±SD	*p*	n	Mean±SD	n	Mean±SD	*p*
Age (year)	19	34.1±9.1	28	22.0±5.6	<0.001	17	34.2±9.7	30	22.7±6.1	<0.001
Symptom duration (years)		16.6±8.1		7.0±5.1	<0.001		16.5±8.5		7.7±5.7	<0.001
Preoperative QoL		89.1±4.5		78.9±7.4	<0.001		89.4±4.4		79.4±7.4	<0.001
Postoperative first month QoL		50.1±15.3		20.5±1.6	<0.001		50.8±16.0		22.0±6.1	<0.001
Postoperative sixth month QoL		42.8±15.5		20.5±1.6	<0.001		43.9±16.1		21.4±3.8	<0.001
Preoperative HDSS		3.7±0.4		3.6±0.4	>0.05		3.8±0.4		3.6±0.4	>0.05
Postoperative first month HDSS		1.8±0.7		1.0±0.0	<0.001		1.8±0.7		1.0±0.1	<0.001
Postoperative sixth month HDSS		1.8±0.7		1.0±0.0	<0.001		1.8±0.7		1.0±0.1	<0.001

CH: Compensatory hyperhidrosis; SD: Standard deviation; QoL: Quality of Life; HDSS: Hyperhidrosis Disease Severity Scale.

According to the hyperhidrosis follow-up questionnaire, there was no pain at the wound site in 41 patients (87.2%) at the postoperative first month, while there was mild pain in six patients (12.8%). At the sixth-month follow-up, there was no pain at the wound site in 45 patients (95.7%), while there was mild pain in two patients (4.3%). When the patients were questioned with regard to the wound site scar formation, 40 patients (85.1%) responded as "very good" and seven patients (14.9%) responded as "good" at the postoperative first month. At six months, 44 patients (93.6%) responded as "very good" and three patients (6.4%) responded as "good". In all patients, PPH was successfully treated. Excessive dryness in the hands was seen in four patients (8.5%).

Compensatory hyperhidrosis was seen in 19 patients (40.5%) at the postoperative first month and in 17 patients (36.2%) at the postoperative sixth month. The most common CH sites were the back (12.7%), back-abdomen-leg (8.5%), abdomen (6.4%), chest (4.3%), and abdomen-leg (4.3%). At the first-month control, there was severe CH in four patients (8.5%), moderate CH in six patients (12.8%), and mild CH in nine patients (19.1%). At six months, three patients (6.3%) had the complaint of severe CH, six patients (12.8%) had moderate CH, and nine patients (19.1%) had mild CH.

According to the patient satisfaction at the first month, four patients (8.5%) reported that they would never undergo ETS, while three patients (6.4%) reported as "Probably, I would undergo ETS", nine patients (19.1%) reported as "I would undergo ETS", and 31 patients (66.0%) responded as "I would certainly undergo". At six months, three patients (6.4%) reported that they would never undergo ETS, while two patients (4.2%) reported as "Probably, I would undergo ETS", nine patients (19.1%) reported as "I would undergo ETS", and 33 patients (70.3%) reported as "I would certainly undergo". At the first-month control, 40 patients (85.1%) reported that they would recommend ETS, while seven patients (14.9%) reported that they would not recommend it. At six months, 42 patients (89.4%) reported that they would recommend ETS, while five patients (10.6%) reported that they would not recommend the procedure.

The comparison of the clinical features, HDSS, and QoL scores of the patients with regard to CH and ETS recommendation are presented in Tables 2. There was a statistically significant difference between the first- and sixth-month scores in terms of CH and ETS recommendation, compared to the pre- and postoperative QoL scores, postoperative HDSS scores, age, and duration of symptoms ($p<0.001$). However, the patients were similar with regard to the preoperative HDSS scores, height, weight, and BMI values ($p>0.05$).

DISCUSSION

The patients should be evaluated in detail before the ETS to obtain the most optimal outcomes. Previously available questionnaire studies are quite useful for this purpose. The expectations should be taken into consideration according to the results of the questionnaire, success rates, and the potential side effects should be shared with the patient before making a decision regarding the treatment. Thus, the patients may experience a better postoperative period and may better tolerate the potential side effects. These questionnaires are also valuable for the postoperative follow-ups and determining the QoL. In this study, we evaluated these conditions caused by ETS.

Compensatory hyperhidrosis is the most common and most undesired side effect after ETS with a rate of 3 to 98%.[2] Unfortunately, the cause, severity, and the site of CH cannot be predicted. It is known that

blockage of the second sympathetic ganglion, and blockage of multiple levels including the superior parts lead to more severe CH.[13,14] In our study, the rate of CH was 40.5% at one month and 36.2% at six month. Dongel et al.[15] reported a CH rate of 71.4% in patients with transected R2-5. Cerfolio et al.[2] reported a consensus for standardization of treatment strategies. Accordingly, while a transection of R3-4 for palmar hyperhidrosis shows a high CH risk with a dry hand, only transection of R4 is related with a lower degree of CH with a moist hand. In our study, R3-4 was transected and PPH was treated with a 100% success rate, and no residue or recurrence was observed in the treated region. Although CH is seen at high rates following ETS, QoL is observed to improve in most patients. However, patient satisfaction varies depending on the CH severity. In our study, CH was significant in terms of the pre- and postoperative first- and sixth-month QoL scores, postoperative first- and sixth-month HDSS scores, age, and the duration of symptoms. In addition, we found that CH was more common in patients who were older than 34 years, the duration of symptoms longer than 16 years, in whom the QoL scores and postoperative HDSS scores were higher. Only three patients with severe CH reported that they would never undergo ETS and two patients with moderate CH reported that they would probably undergo ETS. Based on this finding, except for those who were defined as ideal ETS candidates by Cerfolio et al.,[2] we suggest that patients should be evaluated in more detail, the operation should be limited to the R4 level, the clip method should be applied due to reversibility, or the operation should not be recommended to those having a high risk for severe CH.

Although many studies measure the hand temperature to evaluate the intraoperative success of the procedure, we measured the PI value, which was used by Klodell et al.[12] Accordingly, together with the transected sympathetic chain, the PI value measured in the pulse oximetry device begins to elevate at approximately the first minute and, unless there is an accessory pathway, it remains elevated at the second min. The PI value increases earlier than the hand temperature, and its numerical value is higher.[12] In this study, we showed that the PI value significantly increased at 5 min after the transection.

Apart from the invisible scar tissue, we do not consider the trans-umbilical sympathectomy performed with flexible endoscopy as being more advantageous with regard to less pain and scar tissue development.[9] Although Zhu et al.[9] did not observe diaphragm pathologies in the long-term follow-up, abdominal irritation may lead to intra-peritoneal adhesions and diaphragm dysfunction. Furthermore, the necessity for switching to the standard method in case of pleural adhesion development is a negative condition for the patient. Trans-areolar endoscopic sympathectomy is another ETS method.[10] The advantages of this method include its applicability without intubation and that scar can be concealed. However, the possibility of injuring the sensitive breast tissue using the port continuously, being able to be applied only in males and second incision requirement in pleural adhesion are the disadvantages. Our method caused minimal pain by reducing the compression on the intercostal nerve using a thin port and removing it during the procedure. The procedure may be completed without an additional port, even in case of adhesion development. Closing the skin using tissue adhesive provides an excellent aesthetic appearance.

On the other hand, the limitation of our study is that, if a short telescope was used, the endo-dissector and the telescope could cross over at the entrance point due to the camera cap and the removed port. Nonetheless, we used a long telescope to work on the same axis with the endo-dissector.

In conclusion, our study results showed an elevated risk of compensatory hyperhidrosis and severity with the increased age and symptom duration. In addition, many patients reported that their Quality of Life improved, despite compensatory hyperhidrosis. It is important to apply the Quality of Life questionnaire in various seasons to evaluate the severity of the condition, patient satisfaction, and tolerability. Detecting a potentially severe compensatory hyperhidrosis risk and determining the treatment strategies according to this through detailed preoperative assessments and clinical experiences are of utmost importance for the patient satisfaction. We consider that endoscopic thoracic sympathectomy with a single incision less than 1 cm should be the standard intervention with uniportal surgeries, which have become popular, as it is associated with minimal pain and scar development in eligible patients. It is also possible to perform endoscopic thoracic sympathectomy with the uniportal method by minimally enlarging (1 cm) the skin incision and the use of 5 mm endoscopic clips.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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