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**Evaluation of the quality of life 10 years after bilateral thoracoscopic
sympathicotomy in subjects with primary focal hyperhidrosis**

Квалитет живота након 10 година од билатералне торакоскопске
симпатикотомије код особа са примарном фокалном хиперхидрозом

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Evaluation of the quality of life 10 years after bilateral thoracoscopic sympathectomy in subjects with primary focal hyperhidrosis

Квалитет живота након 10 година од билатералне торакоскопске симпатикотомије код особа са примарном фокалном хиперхидрозом

SUMMARY

Introduction/Objective Primary focal hyperhidrosis (PFH) is an idiopathic condition where excessive sweating affects one or more body regions, including axillae, palms, soles, and/or face. Most studies on quality-of-life focus on the period up to one year after bilateral thoracoscopic sympathectomy (BTS). This study aims to determine the 10-year trend in quality of life among patients from the Republic of Serbia with palmar-plantar-axillary primary focal hyperhidrosis, treated with BTS at the R3-R4 level. A secondary goal is to ascertain the existence of compensatory sweating.

Methods All patients underwent a standardized BTS in a single act, through the cutting of ganglia with ultrasonic scissors at the R3-R4 level. For data collection, patients completed the "Hyperhidrosis Quality of Life Questionnaire (HQLQ)," and the Hyperhidrosis Disease Severity Scale (HDSS), preoperatively, postoperatively within 30 days, and 10 years after BTS.

Results The total sample consisted of 103 subjects who completed all three questionnaires. Considering the improvement in Quality of Life (QoL) from the group excellent, good, and average, the postoperative improvement was immediately postoperative in 88.4% of patients, while in the ten-year period, it was 87.4%. No statistically significant differences were found between the assessment of life satisfaction after 30 days and 10 years after BTS. Out of the total number of operated patients, two patients (1.94%) characterized their compensatory sweating as very pronounced.

Conclusion After 10 years from BTS, the QoL remains at an exceptionally high level, with an annual trend of decline of about 0.1%.

Keywords: sympathectomy; sweat; video-assisted thoracoscopic surgery

САЖЕТАК

Увод/Циљ Примарна фокална хиперхидроза (ПФХ) је идиопатско стање код које је ексцесивним знојењем захваћен један или више региона тела, укључујући: аксиле, дланове, табане и/или лице. Већина студија о квалитету живота фокусирана је на период до годину дана након билатералне торакоскопске симпатикотомије (БТС). Циљ ове студије је да утврди десетогодишњи тренд квалитета живота код болесника из Србије са палмарно-плантарно-аксиларном примарном фокалном хиперхидрозом, лечених БТС-ом на нивоу Р3-Р4. Секундарни циљ је утврђивање постојања компензаторног знојења.

Метод Свим пацијентима начињена је стандардизована БТС у једном акту, путем пресецања ганглија ултразвучним маказама на нивоу Р3-Р4. У циљу сакупљања података, пацијенти су преоперативно, постоперативно у период од 30 дана и 10 година након БТС-а попуњавали упитник о квалитету живота „*The Hyperhidrosis Quality of Life Questionnaire (HQLQ)*” и „*Hyperhidrosis Disease Severity Scale (HDSS)*”.

Резултати Укупан узорак чинило је 103 испитаника који су комплетирали сва три упитника. Узимајући у обзир побољшање квалитет живота сумационо из групе одличан, добар и просечан, побољшање је непосредно постоперативно било присутно код 88,4% пацијената, док је у десетогодишњем периоду износило 87,4%. Нису добијене статистички значајне разлике између процене задовољства квалитетом живота након 30 дана и 10 година од БТС-а. Од укупног броја оперисаних, два болесника (1,94%) је окарактерисало компензаторно знојење као веома изражено.

Закључак Десет година након БТС-а задржао се на изузетно високом нивоу, са годишњим трендом пада од 0,1%.

Кључне речи: симпатикотомија; зној; видео потпомогнута торакална хирургија

INTRODUCTION

Hyperhidrosis represents the occurrence of pathological sweating that exceeds the physiological needs of the body for adequate thermoregulation. Primary focal hyperhidrosis

(PFH) is an idiopathic condition where excessive sweating affects one or more body regions, including axillae, palms, soles, and/or face. Severe forms of PFH can have a significant impact on social life, psychological status, and daily activities. Consequently, the overall Quality of Life (QoL) may be diminished. Bilateral thoracoscopic sympathectomy (BTS) represents the only permanent therapeutic solution [1]. Patients usually adapt to changes in thermoregulation several months after undergoing BTS. Few studies address the long-term effect of BTS on QoL. Most studies on QoL focus on the period up to one year after BTS. A small number of studies describe the long-term effect considering a period of 5 to 10 years [2]. This study aims to determine the 10-year trend in QoL among patients from the Republic of Serbia with palmar-plantar-axillary primary focal hyperhidrosis, treated with BTS at the R3-R4 level. A secondary goal is to ascertain the existence of compensatory sweating.

METHODS

The study was conducted as a unicentric, partly prospective, uncontrolled, and non-randomized trial, following the approval of the ethical committee of the Institute for Pulmonary Diseases of Vojvodina, Republic of Serbia (No. 25-VIII/7). Patients were operated on from January 1, 2011, to November 30, 2013. All patients underwent a standardized BTS in a single act, through the cutting of ganglia with ultrasonic scissors at the R3-R4 level. Additionally, accessory fibers of Kuntz were resected over the third and fourth rib in the length of 5–7cm. Patients who had undergone sympathectomy at any level other than R3-R4 were excluded from the study. Only patients with palmar-plantar-axillary primary focal hyperhidrosis were considered. Patients with erythrophobia, palmar-plantar, isolated axillary, plantar, or palmar hyperhidrosis were not included in the study. For data collection, patients completed the "Hyperhidrosis Quality of Life Questionnaire (HQLQ)", created by de Campos et al. [3], and the "Hyperhidrosis Disease Severity Scale (HDSS)", by the "International Hyperhidrosis

Society", preoperatively, postoperatively within 30 days, and 10 years after BTS [3,4]. In addition to the questionnaire filled out ten years after BTS, three independent questions not included in the score were added. The questions were: "Have you developed postoperatively: diabetes mellitus, thyroid disease, malignant disease, psychiatric disease, or injuries to the head or spine?", "Do you have compensatory sweating? If yes, in which regions?". The aim of the question regarding the postoperatively acquired disease was to potentially identify the patients with secondary generalized hyperhidrosis. HDSS responses were descriptively compared, with the QoL rated as very poor – 5, poor – 4, average – 3, good – 2, and excellent – 1. As a condition for performing BTS, it was necessary for the QoL on the preoperative HDSS scale to be very poor or poor. HQLQ responses were numerically compared so that each response was scored. The maximum score was 100, representing the worst QoL, while the best QoL score was 20. The questionnaires were filled out under the supervision of the surgeon who performed the BTS. The difference in QoL after 30 days from the operation was marked as immediate postoperative, while the QoL after 10 years was marked as decadal.

For statistical data processing, the IBM SPSS version 22.0 program was used. Descriptive statistics methods - mean, standard deviation, minimum, and maximum values - were used to display the characteristics of variables. The prevalence of certain variables is presented numerically in the form of frequencies or percentages. For comparing the QoL in relation to time points, a repeated measures analysis of variance (Repeated Measures ANOVA) was used. Results are presented in tables and figures.

RESULTS

The total sample consisted of 103 subjects who completed all three questionnaires. Initially, 483 patients were included in the study, but a vast majority was lost to follow-up after 10 years. The total sample consisted of 65 women (63.1%) and 38 men (36.9%). The age range

of the subjects in the sample was from 23 to 58 years, with an average age of 39.12 years, at the point of completing questionnaire 10 years after BTS. Intraoperative complications included the need for unilateral adhesiolysis of the pleura in one patient (0.97%) and one pneumothorax (0.97%).

Pre-operatively, 68% (70/103) of respondents, after completing HDSS questionnaire, reported their QoL as "very poor" and 38% (33/103) reported it as "poor". Poor and very poor QoL was also a condition for performing BTS. Regarding the period 30 days after surgery and 10 years after surgery, the percentage of "poor" and "very poor" responses was significantly lower, 10.67% (11/103) and 11.65% (12/103) respectively. On the other hand, the percentage of respondents reporting good or excellent QoL was 78.7% (81/103) in the assessment after 30 days, and 72.8% (75/103) in the assessment after 10 years. Considering the improvement in QoL from the group excellent, good, and average, the postoperative improvement was immediately postoperative in the 88.4% (91/103) of patients, while in the ten-year period 87.4% (90/103) patients gave the same answers (Figure 1).

Mean values of 4.67/1.85/1.97 and standard deviations of 0.46/1.09/1.20 were reported respectively for the assessment of the overall QoL before surgery, 30 days after surgery, and 10 years after surgery (Table 1). In order to investigate the effect of time on patients' QoL, a repeated measures analysis of variance was conducted.

The effect of the independent variable, namely time, on the assessment of satisfaction with the QoL in patients, was statistically significant, $F(2,101) = 307.062$, $p < 0.001$, partial $\eta^2 = 0.859$. Post hoc analyses (LSD) established that there are statistically significant differences in the assessment of satisfaction with QoL before surgery compared to the assessment of satisfaction with QoL 30 days after surgery ($p < 0.001$) and 10 years after surgery ($p < 0.001$). The assessment of satisfaction with QoL 30 days after surgery and 10 years after surgery was statistically significantly higher than before surgery. No statistically significant

differences were found between the assessment of life satisfaction after 30 days and 10 years after surgery.

Satisfaction with the QoL during daily activities was processed through 20 items via the HQLQ questionnaire. Within each item, patients assessed their satisfaction with the QoL for a specific daily activity at the same three-time points: before surgery, 30 days after surgery, and 10 years after surgery. For those three time points we found a mean values of 74.22/37.66/36.79 and standard deviations of 17.87/15.11/15.79 (Table 2). The effect of the independent variable, namely time, on the assessment of satisfaction with the QoL during daily activities, was statistically significant, $F(2,101) = 139.285$, $p < 0.001$, partial $\eta^2 = 0.734$. As in the case of overall QoL, post hoc analyses (LSD) established that there are statistically significant differences between the assessment of satisfaction with QoL during daily activities before surgery, 30 days after surgery ($p < 0.001$), and 10 years after surgery ($p < 0.001$). The assessment of satisfaction with QoL during daily activities 30 days after surgery and 10 years after surgery was statistically significantly higher than before surgery. Also, no statistically significant difference was found between the assessments 30 days after surgery and 10 years after surgery.

In the total sample, there were 78 (75.7%) patients who reported compensatory sweating 10 years after surgery. Compensatory sweating most commonly occurred in the abdomen area (32%), back (23%), chest (9%), and combined or other regions (36%). Of those with compensatory sweating, 30.7% stated that it affects their daily activities, while 69.3% reported that compensatory sweating does not affect their daily activities. Out of the total number of operated patients, two patients (1.94%) characterized their compensatory sweating as very pronounced.

The majority of patients in the sample did not have associated diseases (83.5%). Postoperative acquired associated thyroid gland diseases were reported by 11 patients

(10.67%), psychiatric disorders by 6 (5.82%), sinus tachycardia by 1 (0.97%), diabetes mellitus by 1 (0.97%), head and neck injury by 1 (0.97%), and spontaneous pneumothorax several years after surgery by 1 patient (0.97%). The average HDSS scores on overall satisfaction with QoL in the group of patients who had newly acquired associated diseases was 2.35 and patients who did not have associated diseases was 1.89. As can be seen, the score is higher in the group of patients who have associated diseases, which indicates a lower QoL (Figure 2).

Due to the unevenness of the sample regarding this variable, it is not possible to conduct statistical analyses that would indicate whether these differences are statistically significant.

DISCUSSION

Since BTS fundamentally represents an operation aimed at improving the QoL of patients, it is very important to inform patients about the success rate of the surgery and the occurrence of compensatory sweating as the main side effect. Experience has shown that the more informed patients are, the higher is their satisfaction with the surgical treatment. Most studies addressing the topic of QoL after BTS focus on the immediate postoperative period or the period of up to one year [3]. Knowing the trend of QoL, especially maintaining the level of effect achieved after BTS over a multi-year or decade-long period, validates the surgery itself and provides patients with information that can influence their decision to undergo surgery or not. Long-term maintenance of the effect of surgical treatment means improvement in social life and psychological status for them. Most patients seeking surgical treatment have lived with their condition for a certain period, and many of them have tried treatment with other therapeutic options such as the application of botulinum toxin, iontophoresis, systemic anticholinergics, radio waves, or lasers [1].

In our study, patients filled out the questionnaire preoperatively to have a baseline, after 30 days to make the data comparable with most of the data available from the literature. The

period after 10 years from BTS was chosen to highlight the long-term trend. Comparing data over such a long period is only possible with a small number of available studies. The examination of the QoL after BTS has never been done on the population of patients from the Republic of Serbia.

Postoperatively after 30 days in our study, the improvement in QoL was 88.4%, which is comparable with findings reported in the studies by Patrini et al. [4] with 96%, as well as with Estrella-Gaibor et al. [5] at 95.9% (Table 3). The difference in patient satisfaction of 7.5% compared to the Patrini et al. [4] study can be explained by the fact that preoperatively 100% of our subjects reported their QoL as very poor and poor, while in the mentioned study, this number was 87.6%. Estrella-Gaibor et al. [5] report that 98% of patients preoperatively stated their QoL as "poor" and "very poor". If we dissect this group and compare it with ours, we see that in the Estrella-Gaibor et al. [5] study, 38.8% of patients stated their QoL as "very poor," while in our study, this number was 68% [6]. This difference also explains the postoperative difference in QoL because patients who report having a "poor" QoL have only one step to "good," thus immediately entering into a positive result.

The improvement in QoL in studies that examined the postoperative period from 3 months to 3.8 years was from 90.7% to 95.2% [6–9]. The study that provides insight into the trend is Wolosker et al. [10], who measured QoL after 30 days and after 5 years. After 5 years, they reported a decrease in QoL by 0.6% from 90.9% to 90.3%. In our study, the mentioned decline was 1% after 10 years, i.e., from 88.4% to 87.4%. Taking into account both studies, the annual decrease in QoL was about 0.1%. Horslen et al. [11] reported an 84% improvement in QoL at five-year follow-up.

Shabat et al. [12] are the only ones that allow comparison after 10 years from BTS. QoL after 11 years in the mentioned study was 94% in comparison with our 87.4%. Compensatory sweating was 90% compared to our 75.7%.

As 10 years constitutes a long period, we attempted to determine whether postoperatively acquired diseases, could influence increased sweating, leading to a decrease in patients' QoL, even though such conditions should not be related to BTS in principle. Such conditions were present in 11 patients (10.67%) in our study. In the group of patients without newly acquired diseases, the descriptive indicator (1-5) was 1.89, while in the group with newly acquired diseases, it was 2.35. Although statistical significance cannot be drawn due to the unevenness of the sample, it can direct us towards further investigation on this thesis and even potentially indicate that the QoL is higher if we exclude newly acquired associated diseases that affect the QoL. No available study we found has addressed this issue.

As the BTS is an elective surgical procedure conducted mostly on young and healthy individuals, safety of the operation is the most important factor. In our study there were no mortalities, no major bleeding, no accidental organ injuries. Only one case (0.97%) of the pneumothorax requiring chest tube was recorded. Kobayashi et al. [13] reported no intra and perioperative complications in their study which included a total of 151 patients. De Campos et al. [3] reported 7/362 cases (1.8%) with pneumothorax requiring chest tube, two cases (0.6%) with superficial phlebothrombosis and two cases (0.6%) of Horner's syndrome. Katrancioğlu et al. [14] included 30 patients with only three patients developing small pneumothorax treated conservatively.

In our study, we reported one patient with extensive pleuropulmonary adhesions. We managed to perform adhesiolysis and BTS. Although chest tube was not removed intraoperatively, no signs of major bleeding were noted. Due to the adhesions, the sympathetic chain was obscurely seen, but symmetrical BTS was achieved, thus avoiding development of Harlequin syndrome [15].

CONCLUSION

We can say that even after 10 years from BTS, the QoL remains at an exceptionally high level, with an annual trend of decline of about 0.1%. Although the rate of compensatory sweating is highly prevalent, in only a small number of cases it is defined as disabling. Due to the high success rate and long-term sustainable QoL, BTS remains the method of choice for the permanent treatment of primary focal hyperhidrosis.

Conflict of interest: None declared.

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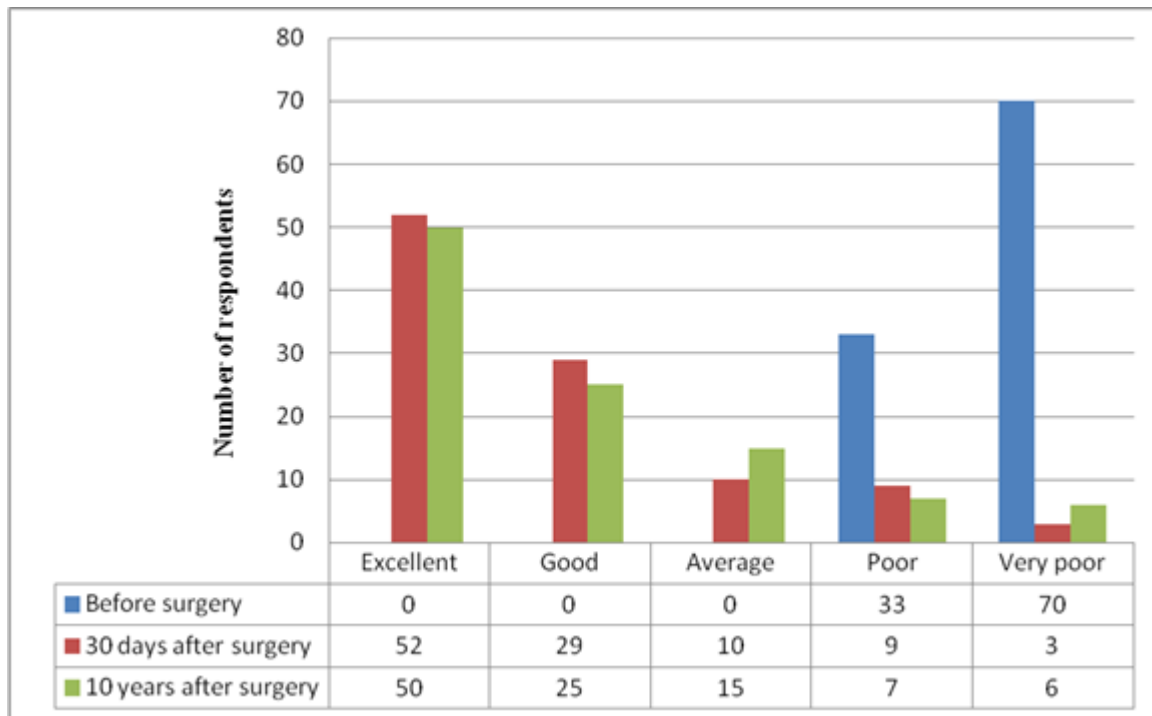


Figure 1. Number of responders to the Hyperhidrosis Disease Severity Scale questionnaire assessing the overall quality of life in three time points

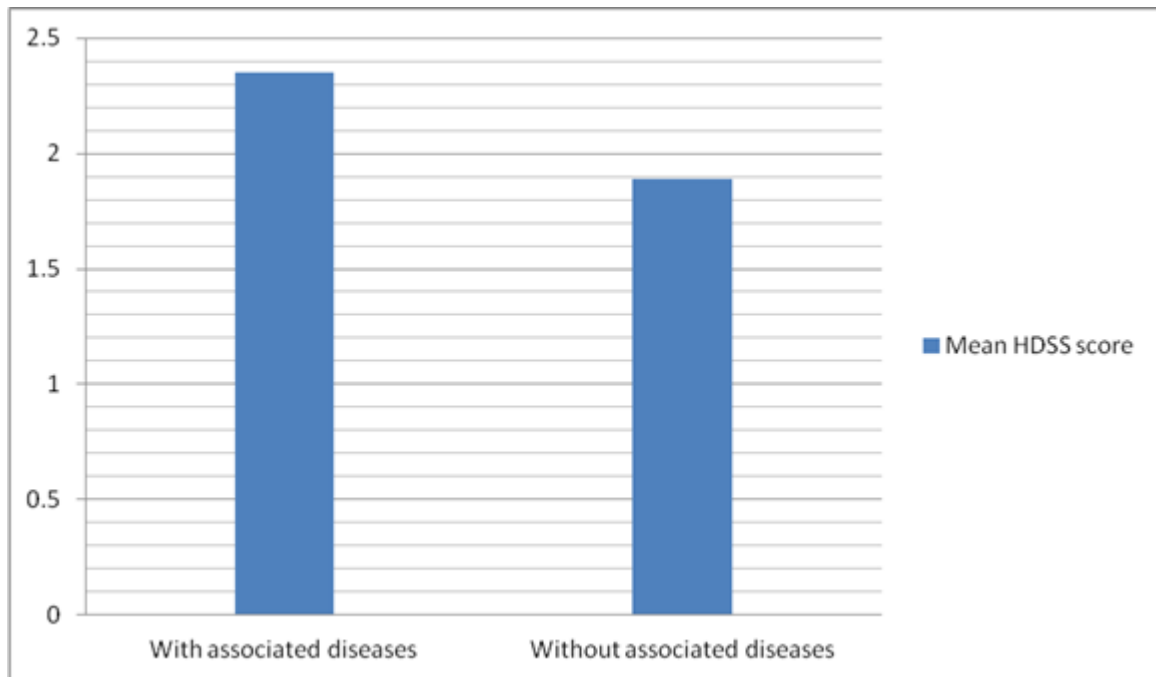


Figure 2. Ten years after surgery, mean Hyperhidrosis Disease Severity Scale (HDSS), showing difference in patient with or without postoperatively acquired associated disease

Table 1. The assessment of the overall quality of life using Hyperhidrosis Disease Severity scale

Time point	M	SD	N	Min	Max
Before surgery	4.67	0.46	103	4	5
30 days after surgery	1.85	1.09	103	1	5
10 years after surgery	1.97	1.20	103	1	5

M – mean; SD – standard deviation

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Table 2. The assessment of the overall quality of life using Hyperhidrosis Quality of Life Questionnaire

Time point	M	SD	N	Min	Max
Before surgery	74.22	17.87	103	20	100
30 days after surgery	37.66	15.11	103	20	84
10 years after surgery	36.79	15.79	103	20	78

M – mean; SD – standard deviation

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Table 3. Results of the quality-of-life findings from studies after bilateral thoracoscopic sympathectomy

Study	N	Follow up	Quality of life improvement (%)	Compensatory sweating (%)
Patrini et al. (2019) [4]	403	30 days	96.1	-
Estrella-Gaibor et al. (2023) [5]	49	30 days	95.9	89
Hajjar et al. (2019) [6]	100	3 months	94	92
Hemead et al. (2022) [7]	63	6 months	95.2	26.5
Zhang et al. (2021) [8]	367	14 months	90.7	94.6
Gossot et al. (2003) [9]	125	3.8 years	91.2	86.4
Wolosker et al. (2012) [10]	453	30 days 5 years	90.9 90.3	91.8
Horslen et al. (2018) [11]	58	5 years	84	84
Shabat et al. (2022) [12]	150	11 years	94	90