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Analysis of the results of videotoracoscopic sympathectomy in the treatment of hyperhidrosis in patients 40 years or older

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**ANALYSIS OF THE RESULTS OF VIDEOTORACOSCOPIC SYMPATHECTOMY IN THE
TREATMENT OF HYPERHIDROSIS IN PATIENTS 40 YEARS OR OLDER.**

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Impact Statement:

Patients aged 40 years or older benefit as much as younger patients from bilateral
videotoracoscopic sympatectomy for the treatment of hyperhidrosis.

This is the first article that specifically analyzed in a large casuistry the results of
videothoracoscopic sympathectomy in hyperhidrosis patients over 40 years old, and
verified the improvement in the quality of life and clinical improvement in more than
90% of patients, concluding that patients aged 40 years or older benefit as much as
younger patients from this treatment.

ABSTRACT

OBJECTIVE: Several factors that could influence the efficacy and satisfaction of patients after bilateral thoracic sympathectomy (VATS) in the treatment of hyperhidrosis (HH) have been studied, but no studies in the literature have specifically analyzed the effectiveness of treatment and variations in the quality of life of patients aged 40 years or older compared to those of young adult patients (19-40 years).

METHODS: We retrospectively analyzed 2431 hyperhidrosis patients who underwent bilateral VATS and divided the patients into the following groups: a group <40 years old (1760 patients) and a group ≥ 40 years (142 patients). Variables included quality of life prior to surgery, improvement in quality of life after surgery, clinical improvement in sweating, presence of severe compensatory hyperhidrosis and general satisfaction at one month after surgery.

RESULTS: We observed that all surgical patients presented with poor or very poor quality of life before surgery, with similar proportions in both groups. In the postoperative period, we observed improvement in quality of life in more than 90% of the patients, with no significant difference noted between the two groups of patients. More than 90% of the patients in this series had great clinical improvement in the main hyperhidrosis site, with no significant difference between the two groups. Severe compensatory hyperhidrosis occurred in 23.8% of the patients in this series, with no significant difference between the two groups.

CONCLUSIONS: Patients 40 years of age or older benefit just as much as younger patients from VATS performed to treat primary hyperhidrosis, presenting excellent, significant surgical results.

INTRODUCTION

Primary hyperhidrosis (HH) is sweating that exceeds the physiological need of the body. HH has a major impact on the quality of life of these patients, affecting both their personal and professional relationships.^{1,2} In most cases, HH presents with initial symptoms in childhood and adolescence and persists throughout adulthood, with patients seeking medical care more often during their economically active ages.^{3,4}

Treatment with oral anticholinergics, especially oxybutynin, generates clinical improvement in most patients and is also effective in patients over 40 years of age; these agents are the first treatment option for HH and are primarily used in patients over the age of 40 who prefer noninvasive treatment to avoid the risks of surgery.² Most patients are operated on in early adulthood or in their teenage years,^{5,6} because HH is a disease with a significant negative impact on these patients' quality of life, which causes patients seek medical treatment earlier.

Several factors that influence efficacy and patient satisfaction after bilateral thoracic sympathectomy include body mass index,² levels of resection,^{7,8} quality of life before surgery, and the number of resected sympathetic ganglion.⁹ To the best of our knowledge, there are no studies in the literature that specifically analyze the results of sympathectomy in patients over 40 years of age and compare surgical outcomes with those of young adult patients (19-40 years).

The aim of this study was to analyze the effectiveness of treatment, the variation in quality of life and the general satisfaction one month after surgery in patients 40 years of age or older (142 patients) subjected to VATS compared to patients under 40 years of age (1760 patients).

METHOD AND CASE STUDY

We retrospectively analyzed 2431 patients from the ambulatory clinic specializing in HH who underwent bilateral VATS from January 2000 until February 2017. This study was approved by the Research Ethics Committee of the institution.

All patients treated by our service have been routinely evaluated since 2000 with regular completion of a specific medical record that includes the following: demographic data, description of all sites of HH, a specific quality of life questionnaire standardized by Amir et al.¹⁰ translated into Portuguese by Campos et al.^{11 12} and quantification of the degree of improvement at each point after treatment using a specific questionnaire.

In this study, we divided the 2431 patients with primary HH who underwent surgical treatment into the following two groups: a group <40 years (ages between eighteen years and thirty-nine and eleven months- 1760 patients), and a group ≥40 years with patients aged forty years or over (142 patients). All patients less than 18 years of age (529) were excluded.

The demographic data, the main site of hyperhidrosis and the level of resection in the VATS of the two groups are shown in Table 1.

The two groups were similar in terms of sex, with the female sex being more prevalent, in both. The mean age of the group <40 was 25.82 years; in the group ≥40, the mean age was 44.78 years, with the maximum age in this group being 70 years old. The mean body mass index in this series was significantly higher in the group ≥40 years (kg/m² x 21.9 kg/m²).

Regarding the main site of hyperhidrosis, the groups were significantly different; in the ≥40 years group, there was a higher frequency of axillary (38.7% x 33.9%) and craniofacial (7.7% x 1.8%) hyperhidrosis. In the analysis of the VATS ablation level, resection of a single chain at G4 was the most frequent in both groups, and the G2 level (G2 isolated and G2/G3) was more frequent in the group ≥40 years, but there was no significant difference in the distribution of techniques between the groups.

Patients were subjected to clinical and quality of life assessments on two occasions as follows: once prior to surgery and then at one month after the operation. All the evaluations were performed by the primary or last investigator. The primary endpoints in the study were as follows:

1. The patients' quality of life at the first visit, prior to surgery.
2. After the first postoperative month, we evaluated the improvement of quality of life after surgery, the clinical improvement of sweating, the presence or absence of CH and general satisfaction.

For the measurement of the degree of satisfaction, we used a protocol of quality of life described by Amir et al.¹⁰ translated to Portuguese by Campos et al.^{11 12} Before surgical treatment, the patients completed the quality of life assessment without any physician involvement. This protocol consisted of 20 questions divided into four domains (functional-social, personal, emotional and special conditions) with five levels for response described in the tables where only one answer was allowed for each question. The patients were classified into five different levels of satisfaction calculated as the summed total score from the protocol, ranging from 20 to 100. When the sum was greater than 84, the quality of life was considered very poor; from 69 to 83, bad;

from 52 to 68, good; from 36 to 51, very good and from 20 to 35, excellent quality of life.

The improvement in quality of life after surgery was evaluated using the same protocol and classified the patients into the following different levels of improvement calculated as summed total score from the protocol: greater than 84, we considered the quality of life to be much worse after the surgical treatment; from 69 to 83, a little worse; from 52 to 68, equal; from 36 to 51, a little better and from 20 to 35, much better.

The clinical improvement of sweating after treatment was defined with a quantification scale ranging from 0 to 10, in which 0 represented no improvement, while 10 represented absence of sweat (anhidrosis) for each site of hyperhidrosis, based on the patients' own assessment. The clinical improvement was graded as follows: null (0-4); moderate (5-7); and great (8-10), based on the note regarding the patient's main complaint.

The general degree of patient's satisfaction after surgery was quantified using a questionnaire of 4 alternatives for the patients' description of their general satisfaction with the surgical outcomes. The patient's general satisfaction was considered excellent if the patient was 100% satisfied after one month of surgery. The patient's general satisfaction was considered good if the patient was 90% satisfied after one month of surgery. The patient's general satisfaction was considered regular if the patient was 75% satisfied after one month of surgery. The patient's general satisfaction was considered low if the patient was less than 50% satisfied with the surgery outcome one month after surgery.

The incidence of compensatory hyperhidrosis (CH) was analyzed using the patient's report, and confirmed by physical examination. The severity of the CH was graded as severe and nonsevere. The CH was considered severe if it was visible, embarrassing and necessitated more than one change of clothes during the day. The CH was considered nonsevere if it was visible and embarrassing but not enough to warrant changing clothes, if it was visible and embarrassing but only occasionally (hot weather and during exercises) or if it was present but did not bother the patient.

For statistical analysis, we used the following tests: Chi-square test or likelihood ratio test to compare sex allocation, HH primary site, sympathectomy resection level, quality of life before surgery, improvement of quality of life after surgery and compensatory hyperhidrosis. Additionally, we used Student's t-Test to compare BMI. The level of significance for all tests was $p < 0.05$.

RESULTS

The analysis of the quality of life before surgery and the improvement of the quality of life after surgery in patients aged 40 years and over and in patients under 40 years of age is presented in Table 2.

We observed that all surgical patients presented with a poor or very poor quality of life before surgery, with similar proportions in both groups.

In the postoperative period, we observed an improvement in quality of life in more than 90% of the patients, with no significant difference between the two groups of patients.

The analysis of the clinical improvement in the main site of sweating after surgery in the two age groups is presented in Table 3.

More than 90% of the patients in this series had pronounced clinical improvement in the main hyperhidrosis site, with no significant difference between the two groups.

The analysis of the prevalence of compensatory hyperhidrosis and its intensity in both groups is presented in Table 4.

Severe compensatory hyperhidrosis occurred in 23.8% of the patients in this series, with no significant difference between the two groups.

The analysis of the degree of patient satisfaction after surgery in both age groups is presented in Table 5.

More than 90% of the patients reported great satisfaction with the surgery. Only 1.5% of the sample reported satisfaction <50%. There was no difference between the two groups in terms of patient satisfaction after surgery.

DISCUSSION

HH is a disease that primarily affects young individuals and causes them to seek medical evaluation early. They undergo various treatments to improve their quality of life.¹³ Primary HH, in most cases, presents with initial symptoms in childhood and adolescence, and persists throughout adulthood.^{14,15}

This study included only patients with primary HH. The prevalence of this disease decreases with increasing age, especially after 40 years, which might be a result of good treatment at a younger age, including having already undergone surgery, a simple adaptation of these individuals to excessive daily sweating or simply an amelioration without physiological explanation. For all patients seeking medical (i.e., noninvasive) treatment for HH, a very popular initial choice is the use of oral oxybutynin,¹⁶ especially for patients older than 40, who frequently have other comorbidities that increase the surgical risk. Many of these patients already use other daily tablets to control those concomitant diseases, and the addition of an oxybutynin tablet to their routine did not generate any of the discomfort mentioned by younger patients, who complained about the daily use of the medication.

All of the aforementioned factors justify that of our sample of 2431 patients submitted to VATS, only 142 patients were 40 years or older (5.8%).

Regarding the epidemiological characteristics, the prevalence of HH in the general population is equal between genders,^{15,17} but the demand for medical care is greater among females, as result of aesthetic concerns and interpersonal relationships, among others, that affect the female group more severely.^{17 18} In this sample, the female gender was also more frequent in patients 40 years of age or older, but there was a higher proportion of men, which might be a result of a reduction in aesthetic concern with the advancement of age among these women.¹⁶

Gallagher et al.,¹⁶ 1996, demonstrated that the percentage of body fat increases with age in both women and men because of a change in the fat deposition process that occurs over the years, justifying a higher BMI in older patients. This difference was observed in this sample, with a significant difference noted in the BMI of the patients, with a mean BMI in the group <40 years (21.9 kg/m²) lower than in the group > 40 years (23.0 kg/m²), following the population trend. These data are representative of our

medical practice since our group operated only on lean patients; the few patients with a BMI greater than 25 were actually individuals with an increased BMI secondary to increased muscle mass, not fat. This finding is supported by the direct influence of the body mass index on the outcome of the surgery and by the increase in the prevalence of severe compensatory hyperhidrosis in the postoperative period of obese patients.¹⁹ Thus, we have as procedure of our surgical team, do not to perform surgeries in patients with BMI greater than 25. In these cases, we suggest that the patient lose weight before the surgery.

Regarding the distribution of the main sites of hyperhidrosis, the two groups were significantly different. Palmar hyperhidrosis was the most frequent site in both study groups but with a smaller proportion among patients aged 40 years or older. We found that the percentage of patients with a major complaint of axillary and craniofacial hyperhidrosis was significantly higher in patients 40 years of age or older, 33.9% versus 38.7% and 1.8% versus 7.7%. Such a finding is compatible with previous studies in our group that demonstrated a higher prevalence of craniofacial hyperhidrosis with increasing age.¹⁶

A higher level of VATS ganglion resection, as well as resections of more than one ganglion level in the same surgery, results in a greater incidence of severe compensatory hyperhidrosis.⁷ Thus, in our group, we avoided resection, and we preferred sympathectomies at the G4 or G3 level. Resections at the G2 level were performed around the world in the early 2000s and are performed only in patients with facial hyperhidrosis today, explaining the reason for the prevalence in our series.

In the analysis of the quality of life before surgery, patients less than 40 years old presented with a worse quality of life than did patients 40 years of age or older, showing that the impact of the disease is higher in younger individuals, affecting their interpersonal skills and social acceptance as they begin their professional career. Despite this issue, patients over 40 years of age had a better quality of life since this is a basic condition for surgical indication.

The success of surgical treatment in patients 40 years of age or older was comparable to VATS results in the general population, including those patients who failed prior clinical treatment,²⁰ with moderate and large clinical improvement in 100% (of patients hyperhidrosis site) of the group ≥ 40 years in this study. Thus, the decision for a late surgical treatment does not influence the positive outcome of surgery in patients 40 years of age or older.

In the postoperative period, we observed improvement in quality of life in more than 90% of patients, with no significant difference between the two groups, demonstrating the important impact of a successful treatment on the quality of life of patients with hyperhidrosis, and regardless of age, there is a clear benefit to operating on these patients.

The prevalence of severe compensatory hyperhidrosis of 23.8% in this series is compatible with the findings published in the international literature.²⁰ In addition, the prevalence of 26.5% of severe compensatory hyperhidrosis in patients 40 years of age or older submitted to VATS was not significantly higher than that in the younger individuals despite the higher frequency of the highest resection level in VATS, mainly including G2 (compatible with a higher prevalence of craniofacial hyperhidrosis), which would be associated with a responsible risk factor for compensatory hyperhidrosis. Despite the greater prevalence of severe compensatory hyperhidrosis in the ≥ 40 years group, the general satisfaction level of patients after surgical treatment was similar

between the two groups, with more than 90% reporting excellent or good general satisfaction after surgery in this series. This finding is because these data reflect the patient's expectation before surgery and the result obtained after the procedure. Only patients who consented to these risks were operated on. The great clinical improvement in hyperhidrosis after VATS and patient insights into the risk of severe compensatory hyperhidrosis before surgery translates into a high degree of general satisfaction with the surgical treatment even when CH is present.

CONCLUSION

Patients 40 years of age or older benefit as much as younger patients from VATS because of primary hyperhidrosis, presenting excellent, significant surgical results .

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Table 1: Demographic and technical data.

		Group	Group	p
		<40 years n= 1760	≥40 years n=142	
Gender				0,186*
	Female	1192 (67,7%)	89(62,7%)	
	Male	559 (31,8%)	53 (37,3%)	
	Average (SD)	21,9 (2,64)	23,0 (2,90)	<0,001
BMI	(Min-Max)	(13,7-32,3)	(16,41-31,14)	
	Average (SD)	21,7 (2,7)	44,78 (5,24)	<0,001
Age	(Min-Max)	(19-39)	(40-70)	
Main Hyperhidrosis site	Palmar (%)	1110 (63,1%)	75 (52,8%)	<0,001*
	Axillary (%)	597 (33,9%)	55 (38,7%)	
	Craniofacial	31(1,8%)	11 (7,7%)	
	Plantar	22 (1,3%)	1 (0,7%)	
Techniques	G2	70 (4%)	12 (8,5%)	0,045*
	G3	592 (33,6%)	39 (27,5)	
	G4	623 (35,4%)	41 (28,9%)	
	G2/G3	274(15,6%)	29 (20,4%)	
	G3/G4	197 (11,2%)	21 (14,8%)	
	G4/G5	2 (0,1%)	0	
	G2/G3/G4	1 (0,1%)	0	

Table 2: Preoperative and postoperative quality of life relationship with the patients' age group.

	Group	Group	
	<40 years	≥40 years	p
	n= 1513	n=120	
QOL before surgery [n (%)]			0,332*
Excellent	0	0	
Very Good	0	0	
Good	0	0	
Bad	478 (27,2%)	45 (31,7%)	
Very Poor	1162 (66,0%)	91 (64,1%)	
QOL improvement [n (%)]			0,670*
Much Better	1328 (75,5%)	110 (77,5%)	
Better	287 (16,3%)	21 (14,8%)	
Equal	60 (3,4%)	6 (4,2%)	
Little Worse	20 (1,1%)	3 (2,1%)	
Much Worse	11 (0,6%)	0	

QOL= quality of life; Likelihood ratio test

Table 3: Analysis of clinical improvement after surgery at the main site of hyperhidrosis in the groups <40 and ≥ 40 years old.

		Group	Group	Total	p
		<40 anos	≥ 40 anos	N=1840	
		n=1703	n=137		
					0,31
Clinical improvement	Great (8-10)	1044 (61,3%)	74 (54,01%)	1118(60,8%)	
	Moderate (5-7)	47 (2,8%)	1 (0,7%)	48 (2,6%)	
	Null (0-4)				
Palmar		11 (0,6%)	0	11 (0,1%)	
[n%]					
					0,31
Clinical improvement	Great (8-10)	519 (86,9%)	49 (35,8%)	561(30,5%)	
	Moderate (5-7)	46 (7,7%)	3 (2,2%)	49 (2,7%)	
	Null (0-4)				
Axillary [n%]		11 (1,8%)	0	11 (0,6%)	
					0,60
Clinical improvement	Great (8-10)	19 (80,6%)	9 (6,6%)	28 (1,5%)	
	Moderate (5-7)	5 (16,1%)	1(0,7%)	6 (0,3%)	
	Null (0-4)				
Craniofacial [n%]		1 (3,2%)	0	1 (0,1%)	
Likelihood ratio test					

Table 4: Prevalence of compensatory hyperhidrosis and its intensity in the two groups

		Group	Group	Total	p
		<40 anos	≥40 anos	n=1852	
		n= 1716	n=136		
Compensatory Hyperhidrosis	Ausente	163 (9,5%)	9 (6,6%)	145 (7,8%)	0,113*
	Non-Severe	1148 (66,9%)	91 (67,0%)	1239(66,9%)	
	Severe	405 (23,6%)	36 (26,5%)	441 (23,8%)	

Chi-square test. Severe= visible, embarrassing and necessitating more than one change of clothes during the day. Non-severe: CH that is not severe.

Table 5: Relation of degree of satisfaction after surgery in each age group

		Group	Group	Total	p
		<40 anos	≥40 anos	n=1827	
		n= 1701	n=126		
					0,37*
	100%	1156 (65,7%)	81 (57,0%)	1237 (67,70%)	
General degree of	90%	395 (22,4%)	35 (24,6%)	430 (23,53%)	
satisfaction [n (%)]	75%	127 (7,2%)	5 (3,5%)	132 (7,22%)	
	<50%	23 (1,3%)	5 (3,5%)	28 (1,53%)	
Chi-square test					