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Sympathectomy in the treatment of primary axillary and palmar hyperhidrosis: what does the evidence say?

Simpatectomia no tratamento da hiperidrose primária axilar e palmar: o que dizem as evidências?

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ABSTRACT

Introduction: Primary hyperhidrosis is a condition characterized by excessive sweat production, exceeding what is necessary to regulate body temperature, with negative consequences for daily life. Some cases are refractory to therapies and medications. In this perspective, sympathectomy emerges, a procedure that aims to resect sympathetic aims to resect sympathetic chains in order to reduce sweating.

Objective: Evaluate the repercussions involved in thoracic sympathectomy in patients with primary palmar and axillary hyperhidrosis, analyzing the indications related to quality of life and patient satisfaction after the surgical procedure.

Method: A Literature Review based on the analysis of the Pubmed and BVS databases, considering the literature available from January/ 2014 to January/ 2024, using articles in Portuguese and English that entered the stipulated inclusion criteria and supported by Prisma 2020.

Result: The studies reviewed accounted for a total of 4.139 patients. The satisfaction rate with sympathectomy ranged from 78.6 to 100%. Depending on the technique, it resulted in between 28,8% and 98,1% of compensatory hyperhidrosis. Around 87% of patients reported a significant improvement in quality of life, with functional and social advances, as evidenced by increased scores and benefits in daily activities.

Conclusion: Sympathectomy proved to be effective, safe and had a positive impact on patients' lives. However, there is a need to standardize questionnaires regarding quality of life, durations and frequency of post-operative follow-up and improve techniques to reduce compensatory hyperhidrosis.

KEYWORDS: Primary hyperhidrosis. Thoracic sympathectomy. Quality of life. Personal satisfaction.

Central Message

Primary axillary and palmar hyperhidrosis has a marked prevalence in adolescence and early adulthood, tending to last throughout life. It progresses with physical, functional, affective, social, occupational, behavioral and mental manifestations, of varying intensity, which can cause discomfort, embarrassment, limitations and stigmas. It requires a multidisciplinary approach and in severe cases surgical intervention is indicated.

Perspective

The literature shows that compensatory hyperhidrosis is a common postoperative complication, but in general, it does not negatively affect patient satisfaction. Sympathectomy, despite its risks, still stands out as a procedure that offers positive impacts on quality of life, better benefits, and long-term results.

RESUMO

Introdução: Hiperidrose primária se caracteriza pela produção excessiva de suor, ultrapassando o necessário para regular a temperatura corporal, com consequências negativas no cotidiano. Determinados casos são refratários às terapias e medicamentos. A simpatectomia visa a ressecção de cadeias simpáticas para redução do suor.

Objetivo: Avaliar as repercussões da simpatectomia torácica na hiperidrose primária palmar e axilar, analisando os indicativos relacionados à qualidade de vida e satisfação dos pacientes após o procedimento.

Método: Revisão baseada na análise de dados do Pubmed e BVS, considerando a literatura disponível de janeiro/2014 até janeiro/2024, utilizando artigos em português e inglês que entraram nos critérios de inclusão estipulados e apoiados no Prisma 2020.

Resultado: Os estudos revisados contabilizaram total de 4139 pacientes. A taxa de satisfação com a simpatectomia variou de 78,6 a 100%. Dependendo da técnica resultou entre 28,8% e 98,1% de hiperidrose compensatória. Cerca de 87% dos pacientes alegaram significativa melhora na qualidade de vida, com avanços funcionais e sociais, evidenciados por escores aumentados e benefícios em atividades cotidianas.

Conclusão: Simpatectomia mostrou-se eficaz, segura e com impactos positivos na vida dos pacientes. No entanto, há necessidade da padronização dos questionários referentes à qualidade de vida, duração e periodicidade do acompanhamento pós-operatório e aprimoramento das técnicas para reduzir a hiperidrose compensatória.

PALAVRAS-CHAVE: Hiperidrose primária. Simpatectomia torácica. Qualidade de vida. Satisfação pessoal.

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INTRODUCTION

Hyperhidrosis is characterized by excessive sweat production, beyond what would be necessary for the regulation of body temperature. Its etiology can be differentiated into primary (idiopathic) - excessive sweating lasting 6 months or more, accompanied by at least 4 of the following criteria: bilateral and symmetrical sweating, absence of night sweating, episodes of sweating at least 1 time a week, onset at 25 years or less, positive family history, and impact on daily activities.[1] The secondary pattern is presented in individuals who have underlying diseases (endocrine conditions, etc.).[2]

The development of primary hyperhidrosis (PH) is complex and multifaceted, involving interaction between genetic, neurophysiological, and environmental factors. The exact pathophysiology is not yet completely understood, but evidence suggests hyperactivity of the sympathetic nervous system playing a central role in this process.[3]

The sympathetic nervous system is responsible for regulating the body's "fight or flight" response, which includes activation of sweat glands to promote heat dissipation and regulation of body temperature. In PH dysregulation leads to excessive and inadequate sweat production, even under normal temperature conditions and without significant emotional stimuli. One of the most accepted theories is that this exacerbation of the sympathetic nervous system causes exaggerated stimulation of sweat glands, especially those controlled by acetylcholine, resulting in disproportionate sweat production.[4]

PH is most common in the armpits, palms, soles, and face. Scalp, inframammary folds, inguinal folds and buttocks can be affected. The location of hyperhidrosis varies from person to person, and some individuals experience excessive sweating in 1 or more body regions simultaneously. The severity of symptoms differs between patients, ranging from excessive sweating in specific situations to constant and exacerbated sweat production in various circumstances.[5]

PH usually manifests in adolescence or early adulthood and tends to persist throughout life. The estimated prevalence in the population is 1-5%, with equal distribution in both sexes and predominant age group between 20-60 years.[6]

PH courses with physical, functional, affective, social, occupational, behavioral and mental impairments.[7] The experience of patients with hyperhidrosis, sometimes underestimated by health professionals, can range from increased local humidity to dripping, making simple daily activities such as shaking hands and signing documents difficult. Excessive and uncontrolled sweating can result in discomfort, embarrassment, stress, anxiety, depression, social rejection, and discrimination.[2] Negative evaluation by society, whether or not incorporated by the patient, impairs their well-being and quality of life (QoL).[8]

The World Health Organization recommends that QoL is the individual position in life, considering culture, values and social systems, as well as goals, expectations, standards and concerns.[9] In PH, QoL is compromised in different dimensions, with repercussions on physical symptoms, emotions and stress, social activities and relationships, self-worth, self-esteem and confidence. Patients often report avoiding social or professional situations due to fear of being noticed for excessive sweating. People with hyperhidrosis are more susceptible to social phobia induced by low perception of haughtiness, seeking situations of greater isolation and seclusion. PH predisposes to psychiatric disorders and hinders relationships between family and friends, together with declines in professional careers.[10]

The constant contact of the skin with excessive humidity favors the development of skin irritations, fungal infections and contact dermatitis.[2] Bacteria and yeasts from the skin biota can degrade sweat, producing substances that give off an unpleasant odor (bromhidrosis or osmidrosis) further aggravating physical, social and emotional discomfort.[11]

Several questionnaires with different psychometric properties (reliability, validity, responsiveness, and interpretability) are used to analyze the impact of hyperhidrosis on QoL, such as the Hyperhidrosis Quality of Life Questionnaire (HHQOL), the Hyperhidrosis Severity Scale (HDSS), the Dermatology Life Quality Index (DLQI), and the SF-36 QoL Scale (Medical Outcomes Study 36-Item Short-Form Health Survey) and others.[3,8]

Clinical treatments of PH involve multiple strategies depending on the severity of symptoms and the response to applied therapy. As a first line of intervention, topical antiperspirants are good options, being mainly represented by aluminum chloride solutions. The therapeutic arsenal includes oral anticholinergics, iontophoresis, botulinum toxin injections, and therapies involving microwaves, lasers, and specific radiofrequency.[1] For mental health, multidisciplinary management is used, such as anxiety medication, cognitive-behavioral therapy, psychological support, physical and leisure activities, support groups, and attention to other needs to reduce stigma, improve coping, self-esteem, and QoL.[8]

The surgical intervention of sympathectomy is indicated for those patients in whom the other methods did not have the expected effects, bringing, even with the attempt at treatment, impairments in QoL.[6] In this surgical procedure, the ganglion and the sympathetic chain are resected or destroyed. The sympathetic chain denominated as R1, R2, R3, R4 and R5 corresponds to each costal arch. The surgical approach can be performed on the upper or lower rib, depending on the area of PH being treated.

The most commonly used types of thoracic sympathectomy are: endoscopic thoracic sympathectomy, video-assisted thoracoscopy sympathectomy, and segmental sympathectomy. Endoscopic thoracic sympathectomy involves less invasiveness, with more stable postoperative periods, and better recovery, as it employs the endoscope to access the sympathetic nerves.[12] Unlike video-

assisted thoracoscopy sympathectomy, which uses video-based equipment to better guide the procedure, this technique has become a technique of superior accuracy and precision to the others.[3] Surgical procedures offer benefits; however, they are not exempt from immediate or late risks that must be clarified to patients (bleeding, infection, postoperative pain, nerve injury, compensatory sweating), prevented and/or minimized.[13]

Compensatory sweating is the most frequent side effect of sympathectomy, with variable prevalence and unknown pathophysiology. It is manifested by the appearance of sweating in other areas of the body, being influenced by the level of section of the sympathetic chain. Most of the time it is tolerable, and noticed on warmer days in the abdominals, back, buttocks and legs.[14,15] Each case requires a personalized assessment of the risks and benefits of the respective treatments and long-term follow-up.[16,17]

This study aimed to analyze the repercussions of sympathectomy on the treatment of palmar and axillary PH on QoL and patient satisfaction.

METHOD

Search strategies

This is a review study using the literature on thoracic sympathectomy in the treatment of axillary and palmar PH as a data source in order to know its repercussions on QoL and patient satisfaction. The investigation followed the Cochrane recommendations for the construction of a systematic review and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol.[18]

The scientific databases: Pubmed and VHL were consulted, using the terms "primary hyperhidrosis", "surgical treatment" and "sympathectomy" of the Medical Subjects Heading (MeSH), and the keywords were consulted individually and combined using the Boolean operator "AND", according to the PICO method (Table 1). In addition, the same terms in Portuguese were used for complementary secondary research.

The search was restricted to studies published in English or Portuguese between January 2014 and January 2024. For the elaboration of the research question and its objective, the FINER strategy (F: feasible, executable) was applied; I: interesting; N: novel; E: ethical ("ethical"); and R: relevant.[19]

TABLE 1 — Search strategy

Population	Adolescent to elderly patients who have palmar and axillary PH
Intervention	Thoracic sympathectomy
Comparison	Non-Intervention
Outcomes	Improvement in QoL

Eligibility Criteria: Data Extraction

The following criteria were used to consider the study eligible for general analysis: 1) reading the full text related to the article with free and open access; 2) articles written in English and Portuguese; 3) target audience among adolescents and the elderly; 4) minimum sample of 35 patients; 5) themes that address sympathectomy in situations of palmar and axillary hyperhidrosis, including its particularities and possible complications, which address QoL analyses of those who underwent the procedure. Thus, publications were excluded when: the full texts were not accessible, there was no assessment of QoL, they were duplicated and they did not have a design that corresponded to the objectives of the present study.

Six reviewers independently selected the titles and abstracts of the articles and, when it met the eligibility criteria, the full text was read and included in the sample set. Any disagreement about study selection among the reviewers was resolved through consensus or consultation with an external reviewer. The retrieved data included: study title, first author, year, study design, study setting, study period, total number of cases, type of PH, type of sympathectomy, conversion rates to compensatory hyperhidrosis (CH), complications during and after the surgical procedure, personal satisfaction rate, and indicators for QoL analysis.

The Prisma 2020 protocol guided the initial selection process of studies in the systematic review that went through the 5 stages: studies removed before screening, inclusion criteria, exclusion criteria, excluded studies, and studies evaluated in full and excluded (Figure).

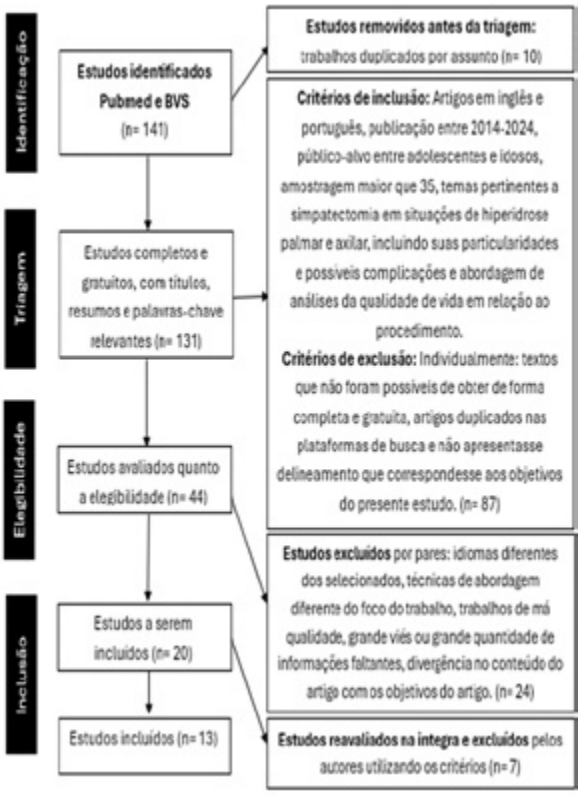

FIGURE — Selection of articles for systematic review.

The PEDro Scale (in Brazilian Portuguese) was used to assess the methodological quality of the studies, according to 5 aspects: I) participant eligibility criteria

were specified; II) postoperative follow-up time: ≥1 year; III) use of QoL instrument; IV) adequate statistical analysis; V) Qualis B1 or higher.[20] (Table 2)

RESULT

This review included a total of 4139 patients, mostly women (62.3%), aged 21-27 years, who underwent thoracic sympathectomy due to palmar and axillary PH. Among the minimally invasive techniques used, endoscopic thoracic sympathectomy and video-assisted thoracoscopy sympathectomy stood out. The postoperative follow-up interval ranged from 1-122 months (mean 20 months). The progression to CH ranged from 28.86% to 98.10%, depending on the level of nerve resection of the sympathectomy and the area of PH initially affected. The patient satisfaction rate recorded in the analyzed articles was 71-100%.

The methodological quality of these articles is shown in Table 2.

TABLE 2 — Analysis of the methodological quality of the studies analyzed (n=13)[3-6,10,12,13,21-26]

Articles selected/criteria	(I)	(II)	(III)	IV)	(V)	Total Points
Dias et al. (2016)[13]	1	0	1	1	1	4
Ho et al. (2020)[21]	1	1	0	1	0	3
Gunn et al. (2014)[4]	1	0	0	1	1	3
Horslen et al. (2018)[5]	1	1	1	1	1	5
Baroncello et al. (2014)[22]	1	1	1	1	1	5
Li et al. (2018)[10]	1	1	1	1	1	5
Musa et al. (2018)[12]	1	0	0	1	1	3
Qian et al. (2018)[23]	1	0	1	1	1	3
Sobrinho et al. (2017)[24]	1	1	1	1	1	5
Vanucci et al. (2017)[6]	1	1	0	1	1	4
Wang et al. (2018)[25]	1	0	1	1	1	4
Wolosker et al. (2022)[3]	1	0	1	1	1	4
Xu et al. (2024)[26]	1	1	0	1	1	4

NOTE: Criteria used: (I) participant eligibility criteria were specified; (II) post-surgical follow-up time ≥1 year; (III) use of a quality of life instrument; (IV) appropriate statistical analysis; (V) Qualis B1 or higher.

Table 3 presents a comparison of the characteristics of the patients, and Table 4 presents the surgical techniques used, satisfaction rate, follow-up time, and CH in these articles.

TABLE 3 — Comparison between sample size, mean age group, and gender of axillary and palmar PH patients in the reviewed articles (n=4139)[6,10,12,13,21-26]

Authors/year	Sampling	Age Average (in years)	Female	Male
Dias et al. (2016)[13]	54	26	33	21
Ho et al. (2020)[21]	35	27	17	18
Gunn et al. (2014)[4]	97	24	60	37
Horslen et al. (2018)[5]	58	25	55	3
Baroncello et al. (2014)[22]	51	32.4	45	6
Li et al. (2018)[10]	106	28.2	62	44
Musa et al. (2018)[12]	118	22.9	50	68
Qian et al. (2018)[23]	122	21.5	52	70
Sobrinho et al. (2017)[24]	122	25	69	53
Vannucci et al. (2017)[6]	738	24.4	427	311
Wang et al. (2018)[25]	55	24	20	35
Wolosker et al. (2022)[3]	2431	24.7	1618	783
Xu et al. (2024)[26]	152	22	72	80

Table 4 shows the instruments applied in the respective articles to analyze QoL in patients with PH undergoing sympathectomy.

Each questionnaire mentioned in Table 5 has a peculiar focus on the aspects present in the patients' QoL, allowing a comprehensive view of the emotional, social, and physical variables of PH. The STAI questionnaire assesses anxiety in a broad context, while the LSAS focuses on situations of social and performance anxiety. The anxious approach is also analyzed by the SAS, focusing on the somatic symptoms present – tension, discomfort and hypervigilance. Depressive symptoms are assessed by the CESD-R and SDS questionnaires - based on central symptoms of Major Depressive Disorder, while the HADS is aimed at hospitalized patients, was used in this case in the post-surgical period for patients to self-assess anxiety regarding the last week before the questionnaire. The more specific questionnaires for hyperhidrosis, the HHIQ and HQLQ, assess areas of emotional well-being, social relationships, self-esteem, productivity and limitations in activities of daily living. Among the other questionnaires used, the HDSS measures the degree of hyperhidrosis in view of the limitation of daily activities presented, and the EPQ addresses variants related to the personality of the patients, such as extroversion and social adaptation to certain contexts.

The articles that are not present in Table 4 present the following parameters for evaluating the improvement in QoL: degree of reduction in sweating after the operation, conversion to CH, and measurement of patient satisfaction at multiple times in longitudinal follow-up after the surgical procedure, without having used questionnaires that have already been validated.

DISCUSSION

The analyzed articles on the treatment of axillary and palmar PH by means of thoracic sympathectomy showed a young adult population seeking medical help, mostly women (Table 3), probably due to the multidimensional impacts and difficulties of this disease in daily life. In their entirety, these articles pointed out that sympathectomy improves QoL, with few side effects.

Before the operation, Dias et al.[13] detected that 75% of the patients had QoL considered poor or very poor, and after 30 days of the procedure, 87% reported considerable improvement. Horslen et al.[5] showed that 86% of the patients improved after the procedure, with increased ability to write, perform manual work, enjoy leisure and sports activities, squeeze and walk hand in hand, and grasp objects. Baroncello et. Al.[22] applying a QoL questionnaire with scores ranging from 0 to 100, found indices of 34.6 before sympathectomy and 77.5 after the procedure. Wolosker et. Al.[3] indicated that 94.7% of the patients, after the operation, showed improvement in QoL compared to the previous clinical picture. Thus, it is inferred that the impact of this surgical procedure is

TABLE 4 — Comparison between the operative technique used, surgical satisfaction rate, postoperative follow-up time and the occurrence of CH in the selected articles (n=13)[6,10,12,13,21-26]

Selected articles	Operative technique used	Post-surgical satisfaction rate	Post-surgical follow-up time	Compensatory Hyperhidrosis
Dias et al. (2016)[13]	Endoscopic thoracic sympathectomy (R3 and R4)	Improvement in QoL of 90%	6 months	98.10%
Ho et al. (2020)[21]	Endoscopic thoracic sympathectomy (R3 and R4)	100% symptom resolution	Average follow-up of 24 to 48 months	34.30%
Gunn et al. (2014)[4]	Endoscopic thoracic sympathectomy, T2-T3, T2-T4, T2-T5 and T2-T6	-	(retrospective study)	28.86%
Horslen et al. (2018)[5]	Endoscopic thoracic sympathectomy, R3 and R4	97% of satisfied patients	The mean time of investigation after surgery was 60 months (interquartile range, 35 to 122 months)	84%
Baroncello et al. (2014)[22]	Video-assisted thoracoscopy, T3 and T4	54.9% of patients totally satisfied / 31.4% satisfied / 9.8% median satisfaction / 3.9% dissatisfied	Two groups followed: evaluation in patients >12 months postoperatively and evaluation of patients <12 months postoperatively	84.30%
Musa et al. (2018)[12]	Endoscopic thoracic sympathectomy, T2-T3, T2, T3, T4, T3-T4	-	Retrospective study	59%
Qian et al. (2018)[23]	Bilateral video-assisted thoracoscopy, T2-T3, T2-T4, T3-T4	-	1 month	46.72%
Sobrinho et al. (2017)[24]	Video-assisted thoracoscopy, T3 and T4	65.5% of patients completely satisfied and very satisfied / 22.9% satisfied / 6.5 dissatisfied / 4.9% very dissatisfied	12 months	78%
Vanucci et al. (2017)[6]	Endoscopic thoracic sympathectomy (R3 and R4)	95.9% of patients very satisfied / 3.9%% satisfied / 0.2% not satisfied	Average follow-up of 32 months	40.50%
Li et al. (2018)[10]	Endoscopic thoracic sympathectomy, R3	-	12 months	
Wang et al. (2018)[25]	Endoscopic thoracic sympathectomy	-	12 months	67.27%
Wolosker et al. (2022)[3]	Bilateral video-assisted thoracoscopy (G2, G3, G4, and G5)	91.4% of patients satisfied / 5.9%medium satisfaction / low satisfaction 1.3%	1 month	90%
Xu et al. (2024)[26]	Bilateral video-assisted thoracoscopy (T3 and T4)	38.2% of patients very satisfied / 32.9%% satisfied / 19.7% median satisfaction / 2% low satisfaction	36 months	74.30%

TABLE 5 — Questionnaires used by the authors studied to assess the improvement in QoL of patients with axillary and palmar PH submitted to sympathectomy (n=8)[3,5,10,13,22-25]

Baroncello et al., 2014[22]	Dias et al., 2016[13]	Horslen et al., 2018[5]	Li et al., 2018[10]	Qian et al., 2018[23]	Silva Sobrinho et al., 2017[24]	Wang et al., 2018[25]	Wolosker et al., 2022[3]
HQLQ	HQLQ	HQLQ	HHIQ	STAI	Fiorelli Questionnaire	SDS	HDSS
-	HADS	-	LSAS	-	-	SAS	HQLQ
-	-	-	EHIC-R	-	-	EPQ	-

Legend: STAI - State ant Trait Anxiety Inventory (Inventário de Ansiedade Traço-Estado); HHIQ - Hyperhidrosis Impact Questionnaire (Questionário de Impacto da Hiperidrose); LSAS - Liebowits Social Anxiety Scale (Escala de Ansiedade Social de Liebowits); CESD-R - Revised Center for Epidemiologic Studies Depression Scale (Escala de Depressão do Centro de Estudos Epidemiológicos Revisada); HQLQ - Hyperhidrosis Quality of Life Questionare (Questionário de QV da Hiperidrose); HDSS - Hiperhidrosis Disease Severity Scale (Escala de Gravidade da Doença de Hiperidrose); HADS - Hospital Anxiety and Depression Scale (Escala Hospitalar de Ansiedade e Depressão); SDS - Self-Rating Depression Scale (Escala de Autoavaliação de Depressão); SAS - Self-Rating Anxiety Scale (Escala de Autoavaliação de Ansiedade); EPQ - Eysenck Personality Questionare (Questionário de Personalidade de Eysenck);

significant, taking into account that the questionnaires used address the social, professional, psychological and functional spheres.

Endoscopic thoracic sympathectomy has been shown to be particularly effective in the treatment of palmar hyperhidrosis, with a success rate of up to 94%[3,21], but when applied in the axillary region in cases with both forms of PH, the efficacy rate and partial or complete resolution was 40.7% in the axillary region and 99.1% in the palmar region.[12] A study conducted by UNIRIO-RJ[24] showed that 88.4% of patients were satisfied or totally satisfied with the postoperative results. In Chapecó, SC, Brazil research revealed that 96.1% of patients were partially or totally satisfied.[22] These results show the efficacy of endoscopic thoracic sympathectomy in the treatment, varying according to the location of hyperhidrosis, and its positive impact on postoperative QoL.

In general, sympathectomy was more effective in patients with palmar hyperhidrosis exclusively, since in those with axillary hyperhidrosis alone or together, the success rate was slightly lower, in addition to having a higher risk of conversion to CH (increase in the rate by 16-60%).[6] Observing this condition, it is essential to discuss this fact with the patients, making the surgical option in these specific cases the last plan.

HP can increase levels of anxiety and depression, affecting self-esteem, relationships, and social activities with a negative influence on overall life satisfaction. Patients with hyperhidrosis have a prevalence of 21% depression (compared to 16% globally) and 23.7% anxiety (compared to 16% in general situations).[25] Improvement in mental health is evident after sympathectomy, according to a study conducted at Johns Hopkins Hospital where 53% of patients stopped using medication for anxiety and depression within 1 year after the operation.[10] These data show that the positive impact is not only on mental health levels, but extends to QoL.

The maintenance of positive effects in the long term has been observed. According to Baroncello et al.[22] There was no statistical significance between the quantitative score and the postoperative time. Vannucci and Araújo6 achieved rates of improvement of 92% after 1 month and 90.6% after 5 years of operation. Even 10 years after the procedure, levels of improvement in QoL remain high, around 90%.

The studies analyzed showed a high rate of patient satisfaction with sympathectomy due to the improvement in QoL, although CH was a common complication.[14,24] According to Xu et al.[26] 74.3% (n=113) of their patients had CH around 30 days postoperatively. Even though this is a high number, of these, only 14.2% classified themselves as dissatisfied or very dissatisfied. A study

conducted at the University of Iowa,4 classified CH as transient (duration <90 days) and severe CH (duration >90 days), with 29% of the patients presenting transient CH and only 4.1% the severe form, differing from the other authors. For Vanucci and Araújo6, the CH rate was 40.5%, especially during the first month. In contrast, the study by Dias et al.[13] shows that 98% of its patients have some degree of CH, and even so, none reported post-surgical regret.

CH depends on the level of surgical section and number of resected lymph nodes, and despite its high occurrence after thoracic sympathectomy (Table 4), studies suggest that this complication is preferable to PH, since it does not significantly interfere with satisfaction rates and improvement in QoL. Baroncello et al.[22] indicated that patients with CH had a mean QoL score of 77.1, compared to 79.8 for those without the condition, a minimal difference if the levels of well-being prior to the procedure were considered. Dias et al.[13], in turn, pointed out that although the conversion rates to CH resulted in 98.10%, only 4% of the patients reported clinical well-being equal to or worse than the previous ones, and none of them reported regret after thoracic sympathectomy. The explanation that most corroborates these facts is that CH tends to occur in less visible body areas, reducing the psychological impact associated with sweating. Although the technique has some complications,[3,4,6,12,24] or has CH as its main side effect, it still has a high approval rate.[10,22]

Among other complications of sympathectomy, pneumothorax occurred in more than half of the studies, affecting 5.9%[12] and 7.2% of the patients.[26] The percentage of recurrence of sweating was almost 1/3 of the cases of Felisberto et al,27 and only 2% in the study by Vannucci et al.[6] Horner's syndrome, mentioned in 10 of the 13 articles, occurred in less than 1% of the patients, and is therefore a very rare complication of this type of operation.

The safety of the procedure and low complication rate is also easily explained by advances in technology and techniques in this type of procedure. Several methods were used by the reviewed articles (Table 5), with the majority being endoscopic/thoracoscopic approaches, varying in the levels of resection.

New therapeutic procedures are being developed, such as the ablation of the eccrine sweat glands of the axillary region, by means of devices that use energy (microwave energy (MyraDry©) and high-intensity focused ultrasound (Ulthera System©). They are promising, minimally invasive techniques and generally with a shorter recovery time compared to traditional surgery.[6] Reducing CH or its negative impact should be part of the main objective in future clinical practice.[28]

New studies addressing the repercussions on QoL could standardize the questions, ideally addressing the 3 premises: 1) domains of QoL with improvement, that is, there was a change in social, physical, mental well-being or autonomy; 2) well-specified follow-up period of patients after the operation, with pre-defined periodicity of questions; 3) intensity of symptoms and which areas were affected in patients with conversion to CH.

The present systematic review in health (SRs) is not registered in the PROSPERO database (International Prospective Register of Systematic Reviews of the National Institute for Heath and Care Research). Other limitations found in the present study were the difficulty in interpreting the "QoL" data, as it is a subjective concept. Although the articles analyzed are based on validated questionnaires, they differ slightly in terms of the parameters evaluated, making it difficult to understand which specific domains achieved improvement (Table 5). The data collected regarding the appearance of CH as a complication are also difficult to interpret in view of the range of the conversion rate presented from 28.86% to 98.10%. On the other hand, patients selected for sympathectomy usually have previous severe and refractory PH. In addition, the presence of CH is usually of lower intensity, and affects less visible areas in relation to it.

However, the findings of the present study add value by showing the repercussions of thoracic sympathectomy in the treatment of PH, especially for the well-being of young people and women, as it allowed us to show high rates of postoperative satisfaction, although with disparity between the instruments that analyzed QoL. The results observed here may help to correct discrepancies, encouraging greater attention and acceptance of PH patients, consequently improving the approach to cases and bringing greater representativeness to these patients and the theme.

CONCLUSION

Sympathectomy, when correctly indicated, is an effective and safe procedure, with a low number of complications, with the exception of CH, which has considerable and variable rates in terms of its occurrence in the postoperative period. Even so, the negative impacts of CH are outweighed by the positive impacts that the operation brings in terms of QoL, visualized in the results from the questionnaires used and the high satisfaction rates reported by the patients. As a result, there are good repercussions and substantial improvement, even considering the heterogeneous way in which data is collected, encompassing social, psychological, and functional factors, over several years. It is of great value to emphasize the need for individualized evaluation for the procedure, analyzing together the history of previous treatments used and the patient's expectations before and after the operation.

Authors' contributions

Ivan Soares Ribeiro Junior – Conceptualization, Research
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