



CLINICAL EVALUATION OF HYPERHIDROSIS TREATMENT WITH MICROWAVE ABLATION

Roberto Chacur*	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa. *Corresponding Author
Honório Sampaio Menezes	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Rodrigo Cadore Mafaldo	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Leandro Dias Gomes	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Danuza Dias Alves	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Nívea Maria Bordin da Silva Chacur	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Fernanda Bortolozo	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Gisele dos Santos Barreto	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Giulia Casa Nova Barbosa	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.
Gabriella Andressa Marchesin de Castro.	Clínica LEGER – Rio de Janeiro – Núcleo de Pesquisa.

ABSTRACT **Introduction:** Axillary hyperhidrosis is a condition that causes embarrassment and discomfort. The most common techniques used to inhibit axillary sweat glands are thoracic sympathectomy, liposuction curettage, and injection of botulinum toxin, all of which have immediate benefits. However, in return, these can generate unsatisfactory effects after some time. **Objective:** This work aimed to evaluate the degree of satisfaction, benefits, and possible adverse effects of the application of microwaves for the treatment of axillary hyperhidrosis. **Methods:** This is a retrospective study of patients with clinical diagnoses of primary axillary hyperhidrosis who underwent treatment with microwave ablation from 2015 to 2018. Medical records were analyzed for demographic data, degree of satisfaction (Likert scale), and adverse effects. Patients were classified according to their hyperhidrosis disease severity scale (HDSS) and clinical results of the treatment to the medical record. The correlation between the findings was made considering the statistical validity of $p = 0.05$. **Conclusion:** The treatment of hyperhidrosis with ablation of sweat glands using microwaves (Miradry®) was safe and presented virtually no adverse effects. Although its effectiveness was below expected, the level of patient satisfaction was considered good.

KEYWORDS :

INTRODUCTION

Focal or primary hyperhidrosis is a disorder characterized by excessive production of bilateral sweating in one or more regions of the body, the armpits, hands, feet, and face being the most commonly affected. Beginning in adolescence and being prevalent in both men and women, the disorder affects approximately 2.8% of the American population, according to a study.¹ It is related to the hyperactivity of the sympathetic nervous system while regulating body temperature, regardless of the ambient temperature. Primary hyperhidrosis is distinguished from the secondary one because the latter affects the body in a generalized way, being related to infectious processes, endocrine disorders, metabolites, neoplastic diseases, neurological conditions, anxiety, stress, among others.²

Focal hyperhidrosis is a condition of unknown etiology; however, its most likely cause would be the hyperexcitability or neurogenic overactivity of reflex circuits involving eccrine glands. Moreover, patients who have hyperhidrosis generally present physical and emotional stimuli, as well as exaggerated temperature increase.³ Nevertheless, an increase in the number of sweat glands was not seen in histopathological samples from patients.⁴ Genetic contribution may also be identified as one of the causes, with 30% to 55% of patients reporting a family history of the disease.^{2,3,4}

There are approximately 4 million sweat-secreting glands in the human body, of which three million are eccrine and responsible for focal hyperhidrosis. These are located on the entire surface of the body, but mostly on the soles and forehead. On the other hand, apocrine glands, which are responsible for odor, are nearly one million and are found mainly in the axillary and urogenital regions.⁴

In addition to unpleasant pathological factors – such as the proliferation of bacteria and fungi, muscle cramps, and eczematous dermatitis –, psychological and social factors affect patients the most.³ These cause great discomfort and embarrassment, significantly affecting the quality of life when common moments of socialization, such as shaking hands or hugging, become embarrassing. Despite these limitations, however, the fraction of patients seeking medical help is still considered small. According to Haider et al., only one-third of the participants had consulted a doctor to treat the problem.⁴

This study aimed to evaluate the treatment of axillary hyperhidrosis using microwaves.

METHODOLOGY

This is a retrospective study of a series of 100 cases involving all patients treated at the Leger Clinic. Patients underwent treatment for

axillary hyperhidrosis with microwave ablation (Miradry® machine) between 2013 and 2017. The following criteria were taken under consideration in this study: demographic information; hyperhidrosis disease severity scale (HDSS); degree of satisfaction (Likert scale); and immediate or late adverse events, such as erythema, edema, paralysis, temporary altered sensation or tingling in small areas of the treated skin or arm, tenderness or pain in the armpit area, hyperpigmentation in the treated area, swelling in the adjacent arm, and tremors. This study was approved by the Research Ethics Committee of the Ernesto Dornelles Hospital under the number 85992318.7.0000.5304.

RESULTS

The cases of one hundred patients who had undergone treatment for axillary hyperhidrosis were studied. Their mean age was 36.8 years (SD = 8.2, min 20 max 66), being the majority (60.2%) between 30 and 39 years of age, and 56% of the patients were male. Their mean body mass index (BMI) was 26.7 (SD = 3.47) and only two patients had a BMI above 30 (31 and 35).

For the microwave equipment (Miradry®), the models of heads most used in the right armpit (62.7%) were 140x80, 140x70, 80x120, 80x140, 70x140. While, the models used for the left armpit (68.6) were 140x80, 80x120, 140x70, 80x140, 70x140. There was no variation in the energy used during applications, all of them being 5. The patients' average hyperhidrosis disease severity scale (one to four) was three (SD = 0.85) and only 30% of them were in the last stage of severity.

After treatment, more than half of the patients (52.6%) reported more than five episodes of excessive sweating and 31.6% had from three to five episodes. Only 10.5% of the cases did not present any recurrent hyperhidrosis episode. Moreover, only one patient did not notice any improvement in sweating 20 days after the procedure and another reported improvement in bromhidrosis. There were no complications related to the use of the device (Miradry®).

The mean degree of satisfaction (Likert scale from one to five) was 2.65 (SD = 1.3) and 54% of the patients said they were satisfied with the results. When comparing the degree of satisfaction with the number of outbreaks, the Kruskal-Wallis test showed no statistically significant difference ($p = 0.657$) between them. In addition, when examining satisfaction according to sex (Mann-Whitney and Kruskal-Wallis tests), no statistically significant difference was found between men and women ($p = 0.521$).

Furthermore, the studied sample indicated the existence of a negative correlation (Spearman $r = -0.356$) between the degree of satisfaction and the severity of the sweating. That is, the greater the severity of sweating, the lower the degree of satisfaction tends to be. However, it is only a trend since the relationship is not statistically significant ($p = 0.135$).

DISCUSSION

Clinical treatments and surgical procedures have been widely used in patients who present symptoms of hyperhidrosis. The vast majority of those have adverse effects, as well as limited and temporary benefits. Among the classic methods is the application of botulinum toxin A that, even after reaching practically complete anhidrosis in seven to ten days after application, has its effect lasting for an average of six to eight months, as well as no reported side effects and high cost.³

The thoracic sympathectomy by videothoracoscopy is the most performed treatment in patients with axillary hyperhidrosis after unsuccessful clinical treatments. The procedure consists of destroying the sympathetic ganglia by either excision, ablation or clipping. Despite its effectiveness in the symptoms of axillary sweating, in an isolated study, 68.6% of patients presented total resolution of symptoms, while 65.2% reported compensatory hyperhidrosis of mild intensity, one year postoperatively, mostly affecting the back and abdomen.⁵ This unpleasant effect, which has been reported several times after thoracic sympathectomies, may be associated with the resection of more than one thoracic ganglion and obesity.⁶

In a study, the second sympathetic ganglion was identified as a probable cause for reflex sweating, being its preservation indicated as a means to avoid this, which is one of the main complaints of dissatisfaction with the surgery.⁷ Horner syndrome, one of the adverse effects most feared in thoracic sympathectomy, had its incidence

increasingly reduced due to a more selective technique of the T4 ganglion and the use of an electric scalpel.⁶ The technique used in the present study presented greater recurrence than sympathectomy (52%); however, side effects and compensatory hyperhidrosis were not observed.

Superficial liposuction curettage of the sweat glands is a non-invasive surgical technique used so that the recovery of the patient could be faster and possible complications avoided. In addition, this procedure leaves less apparent scars and the patients can return to their activities of daily living in a shorter period. The procedure is performed in two stages, the dissection of the dermis from the underlying subcutaneous tissue which is followed by the removal of the sweat glands from the dermis and the region by liposuction curettage or not.⁸ Possible complications listed by the authors are hematomas, ecchymoses, seromas, superficial skin erosions, loss of local sensation, skin necrosis, infection, epidermal inclusion cysts, reduction in the number of hairs, fibrosis, formation of subcutaneous adhesions, scarring, and recurrence of hyperhidrosis.⁸ Clinical improvement of symptoms is identified in 80% of patients with severe hyperhidrosis, not showing significant benefits in cases of mild hyperhidrosis.⁸ Our study did not present the complications seen in the curettage method and also treated cases of mild hyperhidrosis.

In this study, the microwave ablation treatment (with Miradry®) has shown excellent results and minimal adverse effects. The device is capable of heating substances by diathermy. It may reach tissues with high water content and become highly effective for axillary hyperhidrosis, as it penetrates the deep layer of subcutaneous tissue destroying the eccrine and apocrine glands by thermolysis which are then replaced by fibrosis.⁹ The simultaneous suction and cooling system restricts heat to a small area in the upper dermis where the sweat glands are located without compromising the surrounding tissues.^{9,10}

The device has different levels of treatment. For the upper region of the armpit, where the brachial plexus is located, intensity level one is indicated in order to avoid injuries.⁹ Such intensity is suggested because there is a report of a rare case in a patient with low body weight who presented sensory and motor dysfunction in the region, which continued without rehabilitation after six months.¹¹ In the remainder of the axillary region, maximum intensity (level five) is indicated. The procedure lasts from 25 to 40 minutes in each armpit.⁹ No serious side effects were seen in the analyzed cases, as also found by Chang et al., even though the maximum energy level was used.

Adverse effects to this treatment are edema, redness (local inflammation), and vacuum marks, which disappeared in seven days. Sensory changes on the skin of the affected region, strokes, and hair loss were the most prolonged effects reported in a study.¹⁰

Patients in a study by Hong et al. who also underwent the procedure presented an average sweat reduction of 82%, in addition to significant changes in the HDSS four weeks (85%) and 12 weeks (90%) after it. The treatment showed excellent results as well in relation to underarm odor, which was reported to be imperceptible.¹⁰

In this study, there was a patient who reported having no bromhidrosis after treatment, which is expected when it is associated with hyperhidrosis, differently from other procedures, such as intense pulsed light hair removal, when bromhidrosis can occur or be aggravated.²⁰ Results found in this study were below expected when compared to those of Hong et al.; however, still satisfactory. Moreover, when compared to surgical procedures, microwave ablation can be considered safe and with low morbidity.

CONCLUSION

Treatment of hyperhidrosis with ablation of sweat glands using microwaves (Miradry®) was safe and presented virtually no adverse effects. Although its effectiveness was below expected, the level of patient satisfaction was considered good. After observing the benefits of this method, one should recommend it as an alternative treatment for axillary hyperhidrosis.

REFERENCES

1. Strutton DR, Kowalski JW, Glaser DA, Stang PE. US prevalence of hyperhidrosis and impact on individuals with axillary hyperhidrosis: results from a national survey. *J Am Acad Dermatol* 2004; 51:241-8.
2. Lear W, Kessler E, Solish N, et al. An epidemiological study of hyperhidrosis. *Dermatol Surg* 2007; 33: S69-75
3. Gontijo GT, Gualberto GV, Madureira NAB. Atualização no tratamento de hiperidrose axilar. *Surg Cosmet Dermatol*. 2011;3147-51.
4. A. Haider, N. Solish. Focal hyperhidrosis: Diagnosis and management. *Can. Med.*

- Assoc. J. 2005; 172: 69-75.
5. Boscardim PCB, Oliveira RA, Oliveira AAFR, Souza JM, Carvalho RG. Simpatectomia torácica ao nível de 4ª e 5ª costelas para o tratamento de hiper-hidrose axilar. J. bras. pneumol. 2011 Feb; 37(1): 6-12.
 6. Wolosker N, Fukuda JM. O tratamento atual da hiperhidrose. J. Vasc. Bras. 2015 Dez; 14(4): 279-281.
 7. Montessi J, Almeida EP, Vieira J P, Abreu MM, Souza RLP, Montessi OVD. Simpatectomia torácica por videotoroscopia para tratamento da hiperhidrose primária: estudo retrospectivo de 521 casos comparando diferentes níveis de ablação. J. Bras. Pneumol. 2007 June; 33(3): 248-254.
 8. Rezende, R. A. R. M. Curetagem aspirativa para o tratamento da hiperhidrose axilar – passo a passo da técnica. Surg & Cosm Dermatol, 2015 8 (3).
 9. Sánchez-Carpintero, I. Microwave Treatment for Axillary Hyperhidrosis and Bromhidrosis. Actas Dermosifiliog, 2017 Jun; 108(5).
 10. Hong, C.H. Clinical Evaluation of a Microwave Device for Treating Axillary Hyperhidrosis. Dermatol Surg, 2012 May 38(5).
 11. Chang, C.K. Brachial plexus injury after microwave-based treatment for axillary hyperhidrosis and osmidrosis. J Cosmetic Laser Ther, 2017; 19(7).
 12. Nasr, M.W. Comparison of microwave ablation, botulinum toxin injection, and liposuction-curettage in the treatment of axillary hyperhidrosis: a systematic review. J Cosmetic Laser Ther, 2016 Dec; 19 (1).
 13. Hsu, T.H. A systematic review of microwave-based therapy for axillary hyperhidrosis. J Cosmetic Laser Ther, 2017 mar (%).
 14. Glaser, D.A. A Randomized, Blinded Clinical Evaluation of a Novel Microwave Device for Treating Axillary Hyperhidrosis: The Dermatologic Reduction in Underarm Perspiration Study. Dermatol Surg, 2012 feb; 38(2, part 1).
 15. Deewey, T. M. One-year follow-up after thoroscopic sympathectomy for hyperhidrosis: outcomes and consequences. Ann Thoracic Surg, 2006 apr 81(4).
 16. The Dermatology Life Quality Index London: Br Assoc Dermatol. 2014.
 17. Hyperhidrosis Disease Severity Scale [Internet]. Quakertown (PA). Intern Hyperhid Soc; 2014.
 18. Solish, N. et al. A comprehensive approach to the recognition, diagnosis, and severity-based treatment of focal hyperhidrosis: recommendations of the Canadian Hyperhidrosis Advisory Committee. Dermatol. Surg. Off. Publ. Am. Soc. Dermatol. Surg. 2007; 33:908–923.
 19. Varella AYM, Fukuda JM, Teivelis MP, et al . Translation and validation of Hyperhidrosis Disease Severity Scale. Rev. Assoc. Med. Bras. 2016 Dec ;62 (9): 843-847.
 20. Menezes HS, Chacur R, Cirino SMB, Sobrinho MD, Chacur NMSB. Comparison between two intense pulsed light devices used for photoepilation. IJARes, 2019 9:(2)