

Effect of radiofrequency ablation and comparison with surgical sympathectomy in palmar hyperhidrosis

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Received 28 September 2012; received in revised form 15 December 2012; accepted 27 December 2012

Abstract

OBJECTIVES: Hyperhidrosis is a the disorder of excessive sweating in certain regions of the body. It is usually treated with surgical sympathectomy. Radiofrequency therapy has been successfully used for sympatholysis. We tested the primary hypothesis that radiofrequency therapy is independently associated with decreased palmar hyperhidrosis and compared results for patients receiving this treatment with patients who underwent surgical sympathectomy.

METHODS: We included all the patients undergoing treatment for hyperhidrosis between March 2010 and April 2012. Patients who underwent either surgical sympathectomy or radiofrequency ablation for palmar hyperhidrosis were included and analysed. The outcomes studied included complications, success of the procedure, patient satisfaction with their procedure and compensatory hyperhidrosis.

RESULTS: There were 94 patients who met our criteria, of whom 46 (49%) had surgical sympathectomy and 48 (51%) had radiofrequency ablation performed. Radiofrequency had a success rate of 75% in treating hyperhidrosis, but this was found to be statistically lower than for surgical sympathectomy (95%; $P < 0.01$). The groups were similar regarding patient satisfaction ($P = 0.26$) and compensatory hyperhidrosis ($P = 0.78$).

CONCLUSIONS: This is the first clinical study to evaluate the role of radiofrequency ablation and compare it with the surgical treatment option for palmar hyperhidrosis. Radiofrequency ablation significantly decreased hyperhidrosis, but it had a lower success rate than surgical sympathectomy.

Keywords: Hyperhidrosis • Sympathectomy • Radiofrequency • Surgery

INTRODUCTION

Hyperhidrosis is a disorder of excessive sweating in certain regions of the body with plentiful eccrine glands, such as the palms, soles, face and axillae [1, 2]. The incidence of hyperhidrosis ranges from 1 to 4.4% of the population, affecting almost 7.8 million individuals in the USA alone [3–5]. Hyperhidrosis causes significant discomfort for patients, affecting their psychosocial lives and daily activities and increasing the risk of skin infections [1, 2, 6].

Treatment options for hyperhidrosis are divided into surgical and non-surgical options. Non-surgical options are systemic and topical therapies, including botulinum toxin injections, and all these treatments have their limitations [7–9]. Surgical treatments are utilized for severe and refractory cases, which include local and sympathectomy surgery [10]. Surgery has number of limitations; it requires general anaesthesia and can cause significant intraoperative problems and postoperative haematoma, swelling, incisional scarring and pain [11, 12].

Radiofrequency (RF) therapy uses electromagnetic energy, which is deposited in or near nerve tissue. The technique is minimally invasive, low cost, usually carried out on an outpatient basis and easy to administer. Although RF therapy is frequently used for relieving various pain syndromes [13] and there are also successful reports on lumbar and thoracic sympatholysis [14], there is a lack of studies on RF therapy for the treatment of hyperhidrosis.

We tested the primary hypothesis that RF therapy is independently associated with decreased palmar hyperhidrosis and compared it with surgical sympathectomy patients treated between March 2010 and April 2012.

MATERIALS AND METHODS

With Gülhane Medical School Institutional Review Board approval (informed consent was waived), in this retrospective observational

cohort study an analysis of patients undergoing either surgical sympathectomy or radiofrequency ablation for palmar hyperhidrosis between March 2010 and April 2012 was carried out. The program prospectively collects data from preoperative, intraoperative and postoperative variables and outcomes for patients undergoing surgical and interventional pain procedures. Furthermore, long-term follow-up is undertaken in a uniform pattern by surgical or anaesthesiology residents. This aggregate collection of data is intended to promote research and advance the quality of patient care.

We identified all the patients undergoing treatment for hyperhidrosis in the aforementioned time frame from our medical records. Patients receiving medical treatment and non-interventional treatment for hyperhidrosis were excluded from the analysis. Patients with severe bilateral hyperhidrosis in the palm that had not responded to standard, non-surgical treatment were included. Patients who received either surgical sympathectomy or radiofrequency ablation for palmar hyperhidrosis were included and analysed. The primary outcome was patient-reported reduction of sweating (more than 80%) and/or continuing presence of hyperhidrosis after the procedure.

Technique

Surgical sympathectomy. All patients in this group underwent a standard surgical procedure. All the operations were performed under general anaesthesia with double-lumen endotracheal intubation. After initiation of single-lung ventilation, a 1 cm incision was made in the mid-axillary line at the fifth intercostal space. A 5 mm, 0° thoracoscope (Karl-Storz, Tuttingen, Germany) was introduced into the pleural cavity through this incision. After general inspection and identification of the thoracic sympathetic trunk, an endoscopic cautery hook instrument was introduced through the same incision. Cauterization of the sympathetic chain was performed at the level of the fourth and fifth ribs for T4 sympathectomy (Fig. 1). Extensive cauterization was carried out over the rib nearly 2 cm laterally in order to divide the accessory pathways (Fig. 1). A 28

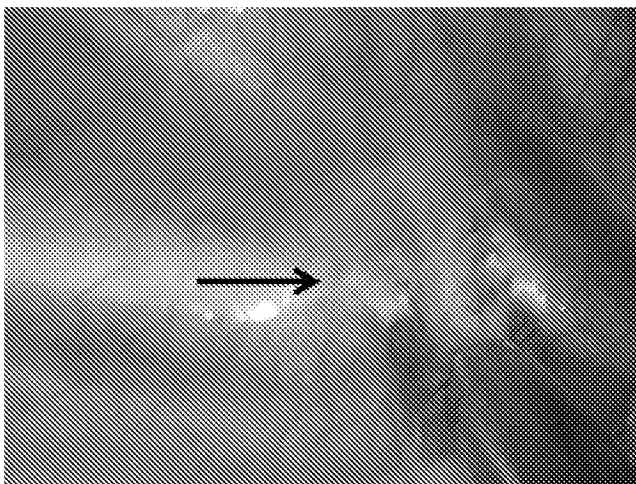


Figure 1: Thoracoscopic appearance of cauterization of sympathetic chain at the levels of fourth and fifth ribs for T4 sympathectomy (black arrow indicate cauterization of sympathetic chain).

French chest tube was placed at the apex of the chest through the same incision. When evacuation of the pneumothorax was completed, the chest tube was removed. The incision was closed in the usual fashion. Sympathectomy on the other side was completed in a similar fashion unless the heart rate decreased below 45 beats/minute. Pneumothorax was also excluded by performing a chest X-ray during the early postoperative period. Patients stayed overnight at the hospital after this procedure.

Radiofrequency ablation. All of the patients underwent the same protocol. Radiofrequency therapy was applied unilaterally, and the other side was treated the following week. We performed the RF ablation in a staged approach to avoid bilateral pneumothorax. Patients were monitored and sedated. The patients were prepared, draped and placed into the prone position. The routine procedure for application of RF therapy in our department is as follows. Following subcutaneous local anaesthetic infiltration, a Cosman RFG-1A Lesion Generator (Cosman Medical, Inc., Burlington, MA, USA) was used for RF thermal ablation. Under fluoroscopic guidance, the 5 mm active cannula of the RF device was advanced to the T4 sympathetic ganglion. When the probe reached the desired point, the level of the cannula was tested by injection of radiopaque material over the parietal pleura (Figs. 2–4). After this test, the electrode of the RF device was placed on the cannula, and the impedance was seen to be between 200 and 400 Ω . In order to check the position of the cannula neurophysiologically, paraesthesia was observed with 50 Hz sensory stimulation at 0.3–0.5 V and no motor contraction was observed with 2 Hz motor stimulation at 1.3–1.5 V. After this neurophysiological testing, RF thermal coagulation was applied at 75°C for 90 s. Following thermal coagulation, 2 ml of 2% lidocaine was applied through the cannula. All patients were monitored for potential complications for 2 h following the procedure. The same pain specialist, experienced in the procedure, performed all the procedures. Patients were discharged home on the same day.

Statistical analysis

Outcomes studied included patient demographics, complications, success of the procedure (examination for the presence

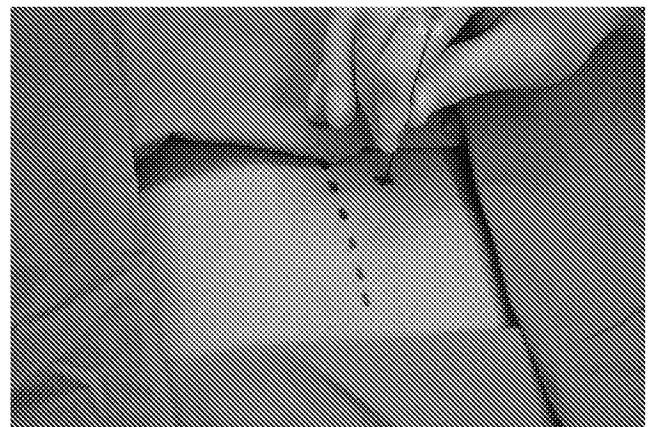


Figure 2: Radiofrequency therapy at the level of T4, showing external needle placement (black dashed line: mid-line; black cross: the cannula entry site).

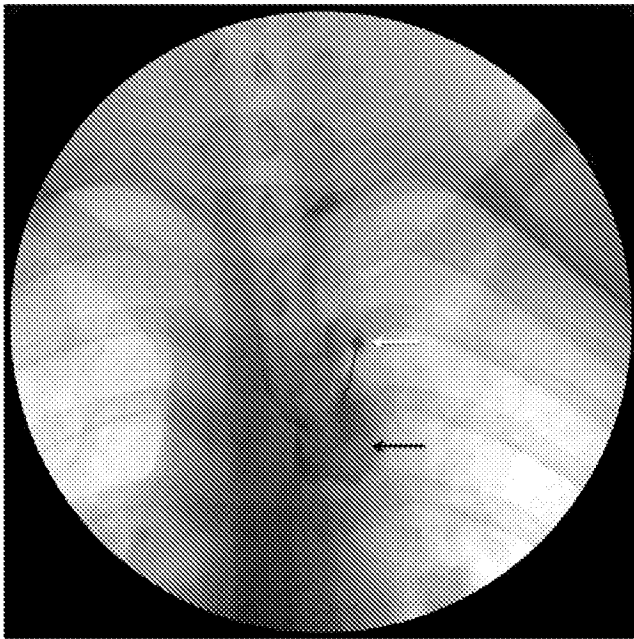


Figure 3: Antero-posterior fluoroscopic view of the radiofrequency procedure (white arrow indicates the cannula and black arrow the distribution of radiopaque dye).

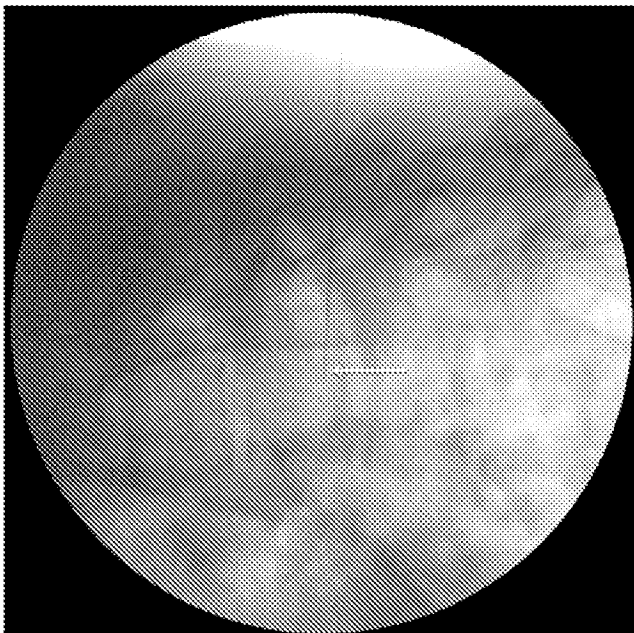


Figure 4: Lateral fluoroscopic view of the radiofrequency procedure (white arrow indicates the cannula).

or absence of palmar hydrosis), patient satisfaction (yes/no) with their procedure and compensatory hyperhidrosis using a scale (Table 1). Data were analysed using the statistical software SPSS version 15.0 for Windows (SPSS for Windows, Chicago, Illinois, USA). Descriptive statistics are presented as the frequency, percentage mean and standard deviation. Differences in age were analysed using Student's unpaired *t*-test, and all other selected outcomes were analysed using the chi-squared test. A *P*-value of <0.05 was considered significant.

Table 1: Classification of compensatory hyperhidrosis

Classification	Feature
No compensatory hyperhidrosis	-
Mild	Sometimes noticeably sweaty and sometimes not sweaty
Moderate	Always aware but not troublesome, or troublesome but controlled by clothing
Severe	Causes embarrassment or regret over having had endoscopic thoracic sympathectomy

Table 2: Comparison of demographic data and clinical outcomes

	Radio frequency group, n = 48 (%)	Surgery group, n = 46 (%)	<i>P</i> -value
Age (years)	26.4 ± 11.5	24.0 ± 3.3	0.87
Sex (female/male)	10/38	9/37	0.18
Hydrosis of the hand			
Dry	36 (75%)	44 (95.6%)	<0.01 ^a
Not dry	12 (25%)	2 (4.4%)	
Patient satisfaction			
Satisfied	35 (73%)	38 (82.6%)	0.26
Not satisfied	13 (27%)	8 (17.4%)	
Compensatory hyperhidrosis			
Not present	32	30	0.78
Mild	10	10	
Moderate	5	6	
Severe	1	0	

Data are represented as means ± SD or n (%).

^a*P* < 0.05.

RESULTS

There were 94 patients who met our criteria, of whom 46 (49%) underwent surgical sympathectomy and 48 (51%) underwent RF therapy. There were no differences in mean age and sex between the groups (Table 2).

The mean follow-up was 15 months (range 2–25 months). Radiofrequency ablation had a success rate of 75% in treating hyperhidrosis, but this was found to be statistically lower than the success rate for surgical sympathectomy (95%; Table 2). We found no differences between the two groups in compensatory hyperhidrosis or patient satisfaction (Table 2). Recurrence was determined in 12 (25%) patients in the RF group and in two (5%) patients in the surgical group; this difference was statistically significant (*P* < 0.01).

All of the patients completed their procedures; none was aborted. Patients in both groups had no significant haemodynamic complications intra- and postoperatively. In both groups, none of the patients developed Horner's syndrome. One patient in the surgical group acquired a lung adhesion to the

chest wall, which did not require surgical treatment. Three patients in the RF group developed pneumothorax, which was treated with a chest tube, and these patients had to stay in hospital overnight. Patients with the chest tube remained in hospital an average of 5 days. Two patients developed haematoma at the injection site, which did not require any treatment. No other significant adverse effects were seen in patients.

DISCUSSION

Nerves from the sympathetic chain in the thoracic area control sweating in the hands. Destruction of these nerves almost always stops hyperhidrosis of the hands. Success rates of surgical intervention in the literature range between 90 and 97% [12, 15], which is similar to our results found in the surgical group. The surgical procedure, however, is not often carried out, because it is invasive and requires general anaesthesia, with significant pain after the surgery. Usually, surgery is the last option in hyperhidrosis, and less invasive, safe and effective treatments are still being sought.

Our study appears to be the first study specifically to evaluate the effect of a radiofrequency ablation procedure in palmar hyperhidrosis and to compare it with surgical treatment. We achieved significant success (75%) with RF ablation, but the success rate (95%) for surgical intervention was significantly higher. Possible explanations for this may be that the RF ablation procedure is complex, and interventional pain physician was relatively less experience in eliciting this block, because it is not performed on a daily basis. This may also explain the relatively high incidence of pneumothorax (6%) seen in the RF group.

There are many adverse effects of sympathectomy, but the most common and disturbing one is compensatory hyperhidrosis [16, 17]. Previous studies also report that compensatory hyperhidrosis is the most important factor in determining the patient's satisfaction with the procedure. The incidence of compensatory hyperhidrosis reported in the literature ranges from 60 to 90% [17, 18]. In our study, the incidence of compensatory hyperhidrosis was 35% in both groups, which is relatively lower than previously reported. This may be due to selection of lower levels for sympathectomy in our study (T3–T4) compared with higher levels in previous studies [18, 19]. It is likely that this may explain the lack of difference in patient satisfaction between groups, although there seems to be a positive trend in surgical patients.

Any retrospective analysis, including ours, potentially suffers from selection bias and confounding, which are normally prevented to a great extent by randomization. However, we included all available patients in the surgical and pain clinic registries in an attempt to decrease selection bias. Nonetheless, it remains possible that the treatment groups differed substantially with respect to important factors that are not included in our registries or otherwise available to us. The decision-making process for selection of patients for the procedure in the thoracic surgery and pain clinics may have differed substantially, which could have contributed to the results. Put simply, patients who were expected to obtain better results for some reason may have been chosen, although all of the patients had tried some non-surgical treatment options prior to the procedure. We also note that the decision by patients of selecting which clinic to approach was not guided by any factors but was dependent on random referrals from other physicians.

CONCLUSION

This is the first clinical study to evaluate the role of radiofrequency ablation and compare it with a surgical treatment option in palmar hyperhidrosis. In the conditions of this study, RF therapy successfully stopped bilateral palmar hyperhidrosis refractory to standard, non-surgical treatment in 75% of patients. Although a larger proportion of patients were successfully treated with surgical sympathectomy, cost-benefit analysis of RF therapy justifies its consideration for treatment of this condition.

Conflict of interest: none declared.

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