CLINICAL STUDY

Percutaneous CT–Guided Sympathicolysis with Radiofrequency for the Treatment of Palmar Hyperhidrosis

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ABSTRACT

Purpose: To evaluate the benefits of computed tomography (CT)–guided percutaneous sympathicolysis with radiofrequency in patients with primary palmar hyperhidrosis (PPHH) in terms of safety, patient satisfaction, and short- and long-term efficacy.

Materials and Methods: A total of 139 procedures in 108 patients (mean age, 29.89 y ± 10.94), including 50 men and 58 women, with PPHH and therapy-resistance of nonsurgical treatments were retrospectively analyzed. Treatment was performed bilaterally at T2, T3, and T4 levels, reaching 90°C during 8 minutes. Technical success, immediate efficacy, and presence of complications were analyzed. For follow-up, the Hyperhidrosis Disease Severity Scale was used to evaluate the hyperhidrosis before, at one month, and in the long-term through a survey of 42 patients. Patients' satisfaction and complications were also recorded.

Results: The technical success rate was 98.56%. The increase in palmar skin temperature was 4.88°C ± 1.85. A total of 85.3% of participants had completely dry hands immediately after treatment. The mean follow-up time was 41.34 months (range, 6–62 mo). One month after treatment, the response rate was 77.38% ($P < .001$). At long-term follow-up, the response rate was 69.04% ($P < .001$). Two major complications were observed (1.8%), 52.38% of patients were satisfied, and 59.52% of patients presented compensatory hyperhidrosis at long-term follow-up.

Conclusions: Percutaneous CT–guided sympathicolysis is a safe and effective technique for the treatment of PPHH and can be considered as a second choice in patients in whom other nonsurgical therapeutic options have failed, despite the compensatory hyperhidrosis rates.

ABBREVIATIONS

HDSS = Hyperhidrosis Disease Severity Scale, PPHH = primary palmar hyperhidrosis, RF = radiofrequency

Primary palmar hyperhidrosis (PPHH) is a common autonomic disorder characterized by a hyperactivation of the sympathetic nervous system, resulting in excessive sweating of the eccrine glands, which are required for the normal thermoregulation of the body (1). Because the sweat glands of the palms are activated mostly by emotional stimuli, this disorder can produce important implications affecting health-related quality of life (2,3) and hindering social participation (4). In most cases, the cause of PPHH is unknown (3). The prevalence of PPHH in the US population is approximately 0.5%–3% (1).

Many treatment options are available depending on the severity of hyperhidrosis. First-line therapy is nonsurgical treatment that includes topical antiperspirants (aluminum chloride), iontophoresis, and the injection of botulinum toxin (4–6). Systemic therapeutic approaches include anxiolytic agents and anticholinergic substances, based on the action of acetylcholine as the neurotransmitter within the sympathetic innervation of the sweat glands (7).

The standard treatment in severe cases of PPHH is bilateral upper video-endoscopic surgical resection of the sympathetic thoracic chain, with success rates of approximately 97% (8). However, this technique is invasive, requires general

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anesthesia, and presents potential perioperative and postoperative complications, such as hemopericardium, pneumothorax, pleural bleeding, pleural effusion, and pain, with a rate of complications of approximately 3.6% in some series (8). It is also associated with undesirable effects such as compensatory hyperhidrosis in as many as 84% of cases in some studies (9).

As an alternative, some authors have advocated the use of percutaneous sympathicolysis of the sympathetic thoracic chain. Wilkinson (10) first described the use of radiofrequency (RF) to treat hyperhidrosis in 1984. RF is a form of electromagnetic energy that generates heat to damage the nervous tissue. Some authors have compared the role of RF versus surgery for palmar hyperhidrosis (11) and concluded that cost–benefit analysis of RF justifies its consideration for the treatment of PPHH. Others still consider surgical sympathectomy as the gold-standard treatment and RF as a second treatment choice (12), but this has been studied in only a small series of cases with a short follow-up.

The aim of the present study was to evaluate the results of CT–guided percutaneous sympathicolysis with RF in patients with PPHH in terms of safety, patient satisfaction, and short- and long-term efficacy.

MATERIALS AND METHODS

Patient Selection

From March 2010 to September 2015, patients with severe PPHH were diagnosed and treated by the Department of Dermatology of a single institution. The diagnostic criteria for PPHH were excessive sweating of more than 6 months' duration, bilateral and symmetric involvement of the eccrine glands, appearance of the symptoms before the age of 25 years, and positive family history (13). The participation criteria for the CT–guided percutaneous RF sympathicolysis technique included patients with PPHH in whom nonsurgical conservative therapeutic options had failed (ie, topical antiperspirants, iontophoresis, botulinum toxin, and anticholinergic substances) and surgery was contraindicated or refused. The criteria excluded all patients in whom the procedure was performed for other reasons, such as facial blushing, axillary hyperhidrosis, or compensatory hyperhidrosis after endoscopic resection of the sympathetic thoracic chain.

A total of 154 thoracic percutaneous RF sympathicolysis procedures were performed in the radiology department. Patients who met the inclusion criteria were retrospectively analyzed, resulting in a total number of 139 procedures in 108 patients (mean age, 29.89 y ± 10.94), which included 50 men (45.87%) and 58 women (54.1%). The institutional review board approved the study protocol, and written informed consent was obtained from all participants for the conduct of this research.

CT–Guided Percutaneous RF Sympathicolysis Technique

The procedure was initiated by determining the access level with a craniocaudal CT scan of the cervicothoracic region performed with a 16-slice CT unit (SOMATOM Emotion; Siemens, Erlangen, Germany). All treatments were performed by two radiologists, with 30 and 10 years of experience in percutaneous interventional procedures, with the collaboration of an anesthesiologist. Vital signs were monitored before and after treatment. Procedures were routinely performed under local anesthesia only, and light conscious sedation was employed by the anesthesiologist when required.

With the patient in prone position, measurements were taken from the theoretical location of the sympathetic ganglion at the lateral aspect of the costovertebral junction to the skin, to determine a safe entry window. The procedure was performed bilaterally at the second, third, and fourth vertebral bodies (T2/T3/T4) as near as possible to the theoretical space of the sympathetic chain and away from the intercostal nerve. After local anesthesia (Mepivacaine) was administered subcutaneously, and following the path of the needle, a 10-cm, 22-gauge needle (Chiba; Cook, Bloomington, Indiana) was introduced to the lateral surface of the vertebral body under intermittent CT guidance. Small quantities of saline serum were injected to detach the parietal pleura. When the needle reached the desired point (paravertebral space) as confirmed by CT, the 10-cm RF electrode device was placed though the needle. Heat was produced by an electric generator and delivered through the tip of a catheter (Neurotherm NT1000 RF system; Medicall Nordic, Bromma, Sweden; **Fig 1**).

After checking the absence of motor and sensitive stimulations with the generator producing a slight RF pulse, CT–uided percutaneous RF sympathicolysis was performed first at the T2/T3/T4 levels of one side and then at the T2/T3/T4 levels of the other side. The RF was applied at 80°C–90°C for 8–10 minutes depending on patient endurance. After the procedure, a repeat CT scan was obtained to rule out any possible complications such as pneumothorax. Patients were monitored for 2 hours and discharged if no complications were observed.

Methodology and Data Collection

Immediate efficacy. —Patient demographic data and technical success, determined as correct needle positioning in the target and correct application of RF energy, were retrospectively reviewed in the clinical history of all patients. Immediate clinical success was evaluated quantitatively by measuring hand temperature before and after the procedure with a palmar thermometer strip, and qualitatively by analyzing the presence or absence of palmar sweating by subjective patient evaluation.

Complications related to the procedure were collected after the treatment based on clinical history and the radiologic report. Major complications were considered those that required therapy, minor hospitalization, unplanned increase in the level of care, or prolonged hospitalization; caused permanent adverse sequelae; or resulted in death. Minor complications were considered those that had no consequences or required no or nominal therapy or overnight