

Conservative Management of Median Nerve Brachial Plexopathy after Microwave-based MiraDry Treatment for Axillary Hyperhidrosis

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Summary: Axillary hyperhidrosis is characterized by excessive sweating of the armpits, which can significantly affect quality of life. A new microwave-based therapy, MiraDry (Miramar labs, Sunnyvale, Calif.), is a promising minimally-invasive treatment option. We report a case of unilateral brachial plexus thermal injury in a thin 19-year-old man treated for axillary hyperhidrosis with the MiraDry system. He initially experienced swelling and pain in the left hand and was prescribed 1 week of methylprednisolone. He then presented 1 week later with induration and swelling of bilateral axillae with swelling of left thumb, left index, and left long fingers, decreased sensation in median nerve distribution of the left hand, and the inability to flex the left index finger DIP joint. EMG showed absent median nerve motor and sensory function, consistent with median nerve plexopathy. He was conservatively managed with close observation and regular occupational hand therapy appointments. At his 12-month follow-up, there was complete return of left pronator teres strength, thumb flexion, and index finger flexion. Decreased sensation remained at the tip of the left index finger. We report the case of median nerve palsy after MiraDry therapy for axillary hyperhidrosis in a thin young man. We recommend using low-energy settings and pre-procedural ultrasound for young, thin patients because of the more superficial course of the brachial plexus within the axilla. (*Plast Reconstr Surg Glob Open* 2021;9:e3992; doi: [10.1097/GOX.0000000000003992](https://doi.org/10.1097/GOX.0000000000003992); Published online 15 December 2021.)

Axillary hyperhidrosis, or excessive armpit sweating, can negatively affect quality of life and is associated with depression. Published data reveal prevalence ranging from 1.4% to 3.1% of young adults. Its pathophysiology is not well-understood, but is believed to be related to sympathetic cholinergic hyperactivity stimulating axillary apocrine and eccrine glands. Treatment includes conservative (antiperspirants, topical foam, and topical anticholinergics), minor (botulinum toxin injections, laser, ultrasound, and microwave therapy), and major surgical interventions (thoracic sympathectomy, suction-curettage, and local excision).¹ A new treatment

modality with increasing utilization is MiraDry (Miramar labs, Sunnyvale, Calif.), which employs application of microwaves (10^4 – 10^5 μm , 5800 MHz) to thermolyze and ablate causative apocrine and eccrine glands in axillary hyperhidrosis. Simultaneous cooling is applied superficially to prevent thermal damage at the epidermal/dermal layers. The MiraDry device has five energy settings [ranging from 1 (low) to 5 (high)]. The amount of energy is dependent on the duration of treatment because power delivered is constant.² We present a case of a young man with axillary hyperhidrosis treated with MiraDry, who developed unilateral median nerve palsy post-procedure. We discuss a successful conservative management approach with observation and occupational hand therapy (OHT) over a 12-month period.

CASE DESCRIPTION

A 19-year-old, right-hand-dominant man with a BMI of 21.8 and a history of generalized anxiety disorder presented 2 weeks after receiving one session of MiraDry therapy for bilateral axillary hyperhidrosis at an outside facility. He reported shooting pain to the left hand during injection of local anesthetic in the left axilla.

Disclosure: The authors declare no financial interest to declare in relation to the content of this article.

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Received for publication September 29, 2021; accepted October 27, 2021.

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DOI: [10.1097/GOX.0000000000003992](https://doi.org/10.1097/GOX.0000000000003992)

Immediately after the procedure, he was unable to flex the left thumb or index finger, with pain, swelling, and a burning sensation in the left hand during the post-procedure period. No right-hand concerns existed. On examination, his left hand was held in the hand of Benediction position, demonstrating a median nerve palsy with 0/5 pronation and thumb opposition strength. There was no flexion of thumb or index interphalangeal joints consistent with a lack of FPL and FDP/FDS function. Tinel’s sign was present in the left axilla and hyperemia in the left hand and forearm. EMG showed absent left median motor and sensory function, severe fibrillations, and severely decreased motor units in left flexor carpi radialis, left pronator teres, and left abductor pollicis brevis.

OHT referral was made. He was seen five times in 6 months for education and practice of range of motion and strengthening exercises. Hand grip and pronation strength were assessed at each appointment (Fig. 1). Four months after the MiraDry procedure, one-pound wrist curls and a figure-eight digit splint to reduce hyperextension of PIP joints were started by OHT. The patient was followed outpatient and re-evaluated in-depth at 6 months and 1 year after the initial MiraDry treatment and was found to have had a full recovery of left hand motor function with 5/5 pronation; however, a slight decrease in sensation at the tip of the left index finger remained.

DISCUSSION

Randomized controlled trials have shown microwave-based treatments effectively treat axillary hyperhidrosis based on the hyperhidrosis disease severity scale.³ An early RCT comparing MiraDry to sham reported no

long-term safety issues in the 81 participants who received MiraDry treatment with the most reported adverse event being altered sensation, numbness, and tingling (9.9%) caused by effects on cutaneous nerves.³ A severe case of right triceps and wrist extension weakness and left hand weakness was reported.⁴ EMG showing left brachial plexopathy involving the median, ulnar, and radial nerves with MRI showing subcutaneous and perineural edema at 3 months.⁴ The report also mentioned axillary pain immediately after lidocaine injection, similarly seen in our case, which raises the possibility of injury by intraneural injection of local anesthetic. Obtaining MRI imaging in our case may have helped.

A commonly cited risk factor is thin and low BMI patients.^{5,6} In one reported case, a man with BMI 18.5 treated with MiraDry on the lowest energy setting (level 1, 2.4sec) presented with left hand concerns of median and ulnar neuropathy.⁵ The authors cautioned that despite using the lowest setting, thin men who lack axillary adiposity are at higher risk for complications, compared with women.⁵ Similar cases have been described in thin women while also using the lowest setting. A young women with a BMI of 15.8 became symptomatic with median and ulnar neuropathy.⁶ With six-months of OHT, her symptoms improved, but long-term follow-up was not available. These reports mentioned consideration of pre-procedural use of ultrasound to evaluate skin layer thickness and underlying anatomy to guide MiraDry treatments.^{5,6}

A prospective clinical study of 31 patients on MiraDry had one patient (3.2%) experience neuropathy.⁷ Another study investigated the pathological changes seen in the skin of the axilla after MiraDry treatment; however, no

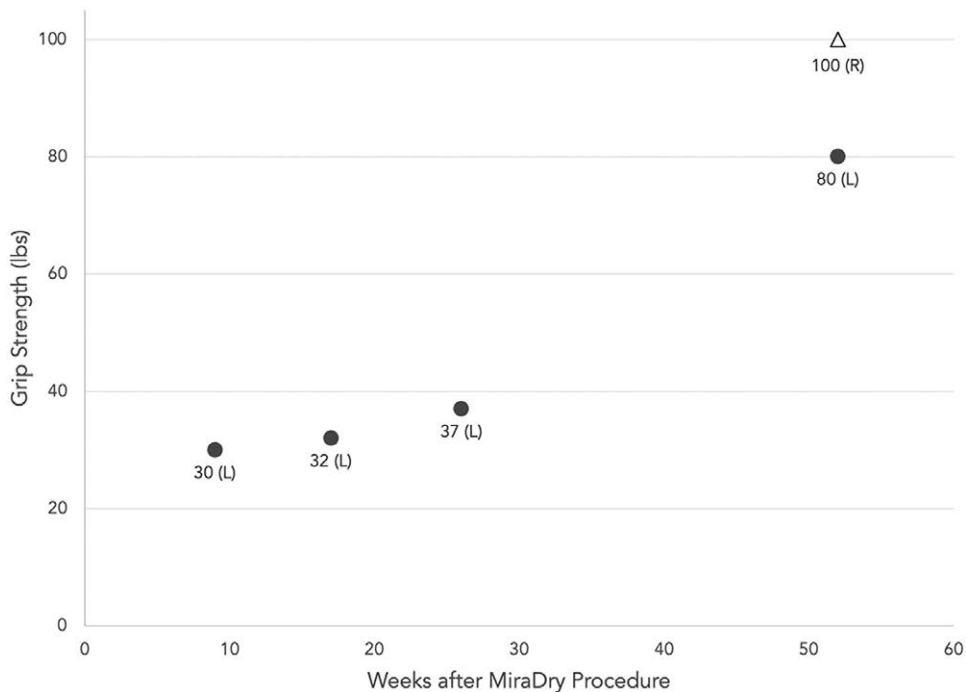


Fig. 1. Hand grip strength of affected left hand over time, as measured at OHT and in outpatient plastic surgery clinic appointments. At 1 year, left hand grip strength improved to 80 lbs compared with contralateral right-hand grip strength of 100 lbs (L = left hand, R = right hand).

pathological specimens showed obvious nerve damage.⁸ More invasive surgical approaches such as thoracoscopic sympathectomy also carry a risk of brachial plexus injuries by nerve traction and compression injury from prolonged hyperabduction during the operation.⁹ Although the mechanism of injury differs between surgical and microwave-based therapies, the treatment approaches are noted to be similar: passive exercise to improve ROM with progressive resistance training.

CONCLUSIONS

We recommend careful attention be paid to thin patients being treated with MiraDry as median, and ulnar neuropathies have been increasingly reported in the literature. Further research to protocolize guidelines for identifying patients at risk would be valuable. Use of the lowest energy settings and pre-procedural ultrasound may reduce the risk of injury. Manufacturing changes to the device to allow even lower energy settings could benefit patient safety. Early detection and vigilance in the immediate post-treatment period can facilitate initiation of earlier OHT and reduce the morbidity and costs associated with complications. Conservative management, as seen in this case, can regain partial-to-complete hand function.

SUMMARY

We report a case of unilateral median nerve palsy complication after one MiraDry treatment of axillary hyperhidrosis that resolved with conservative management after one year of occupational hand therapy. Thin patients with a lower BMI are more susceptible to median and ulnar nerve injury.

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ACKNOWLEDGMENTS

This study conformed to the Helsinki Declaration and appropriate IRB protocols.

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