

Scrambler Therapy for the Treatment of Pain in Schwannomatosis

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Abstract

Purpose: Schwannomatosis patients (SP) suffer from chronic nerve pain that is often inadequately relieved. Scrambler Therapy (ST) can relieve neuropathic pain quickly, safely, and inexpensively. We successfully treated a patient with Scrambler Therapy, adding another tool to the methods used to treat SP pain.

Methods: We treated her with 5 daily sessions of ST, each for 40 minutes.

Results: Complete relief of pain and hyperalgesia, with return to normal function, by day 5, that has persisted.

Conclusion: Scrambler Therapy may be an effective way to treat schwannomatosis pain, and deserves further research.

Introduction

Schwannomatosis is a condition most frequently characterized by development of multiple schwannomas throughout the body, and the most common presenting complaint is chronic neuropathic pain. (1) Classical conservative management of chronic neuropathic pain associated with schwannomatosis involves neuropathic agents including gabapentin, amitriptyline and pregabalin. For schwannomas causing functional limitations, or for patients with refractory pain and/or medication intolerance, surgical resection of the offending lesion remains an effective, albeit more invasive option. (2)

Scrambler Therapy is a relatively new neuromodulatory treatment approach, which has been shown to provide relief from neuropathic pain. (3,4) Scrambler Therapy is believed to be effective by acting on the afferent information aspects of pain, which is accomplished by replacing endogenous pain signals with synthetic signals that travel along the same nervous pathways. These synthetic signals are transmitted via topical electrical stimulation channels which may interact with the surface receptors of C fibers. (5) Through repeated treatments, these synthetic signals can potentially cause a type of “retraining” of the brain, leading to a decrease or resolution of the targeted pain. By nature of its inexpensive minimally invasive methods, Scrambler Therapy has the potential to be another conservative modality of pain relief for patients with schwannomatosis.

Case

This 48-year-old woman with known schwannomatosis since age 40 presented with pain in the right anterior thigh and groin. She reported that the pain felt the exact same in quality and location as when she was found to have schwannomas on her left obturator nerve in 2014. In the last year, the episodes of stabbing pain had increased in frequency, and occurred 5-6 times a day with some episodes lasting hours. The pain was worse with lying on her right side, and alleviated with putting more weight on her left

side when sitting. She denied any numbness or tingling. She did report some weakness of her right leg, but was able to ambulate without any assistance and has not had any recent falls. She denied any saddle anesthesia or urinary or fecal incontinence. In 2014, she underwent left cryoablation of the schwannoma with significant ongoing relief.

The tumor in the right quadriceps muscle appeared deep, with a second tumor more medial and proximal and less distinct. (Figure 1) Gabapentin at effective doses made her feel overly sedated and "foggy-minded." She had inadequate benefit from bupropion and nortriptyline prescribed for depression, low-dose naltrexone, celecoxib, or ketorolac. A diagnostic right obturator nerve block with bupivacaine and steroids gave partial relief but also motor paralysis for 24 hours, so she was not considered a good candidate for ablation. Prior to a trial of spinal cord stimulation, she was referred for Scrambler Therapy.

Electrodes were placed vertically 2 cm above and below the area of the pain on the quadriceps area, and diagonally across the L1 (medially) and L2 (laterally) dermatomes. (Figure 2) She was treated with five 35-minute sessions of scrambler therapy, with the stimulation increased every 5-8 minutes to tolerance. Her pain rapidly resolved and has stayed low for over 3 weeks. (Figure 3) She was able to resume normal activities like driving, cooking, and even skiing. If the pain returns, more sessions can be scheduled as "booster" sessions take fewer sessions, and last longer each time.(6)

Full written permission was obtained to use her story and photographs, and Johns Hopkins does not require IRB approval for three or fewer patient cases.

Discussion

Scrambler therapy has been effective in other types of neuropathy including transverse myelitis, neuromyelitis optica, chemotherapy induced neuropathy, Dejerine-Roussy Syndrome, low back pain, post-herpetic neuropathy, and others. (7-13) We report here the first case of schwannomatosis pain successfully treated with Scrambler therapy, that gave quick and long-lasting relief which enabled the person to resume full function. Scrambler therapy is becoming more available, is easy to do in the office, and can be inexpensive. At about \$250 per session for 1 to 10 sessions, it compares favorably with other treatments such as spinal cord stimulation (over \$100,000 per patient, including the trial) and even drugs such as Cymbalta® (Duloxetine) at \$122/month generic and \$300+/month brand name when used for years (GoodRx®, accessed January 4, 2022). We believe further research is indicated to determine how best to use this new modality in schwannomatosis.

Declarations

Compliance with Ethical Standards:

Funding: This study was funded by X (grant number X).

Conflict of Interest: Authors Murphy, Erdek and Smith declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent: Informed written consent was obtained from all individual participants included in the study. Johns Hopkins does not require Investigational Review Board approval for Case Studies involving three or fewer subjects.

References

1. Mansouri S, Suppiah S, Mamatjan Y, et al. Epigenomic, genomic, and transcriptomic landscape of schwannomatosis [published correction appears in *Acta Neuropathol.* 2020 Oct 28;]. *Acta Neuropathol.* 2021;141(1):101-116. doi:10.1007/s00401-020-02230-x
2. Farschtschi S, Mautner VF, McLean ACL, Schulz A, Friedrich RE, Rosahl SK. The Neurofibromatoses. *Dtsch Arztebl Int.* 2020 May 15;117(20):354-360. doi: 10.3238/arztebl.2020.0354. PMID: 32657748; PMCID: PMC7373809.
3. Marineo G. Inside the Scrambler Therapy, a Noninvasive Treatment of Chronic Neuropathic and Cancer Pain: From the Gate Control Theory to the Active Principle of Information. *Integr Cancer Ther.* 2019 Jan-Dec;18:1534735419845143. doi: 10.1177/1534735419845143. PMID: 31014125; PMCID: PMC6482660.
4. Kashyap K, Bhatnagar S. Evidence for the Efficacy of Scrambler Therapy for Cancer Pain: A Systematic Review. *Pain Physician.* 2020 Jul;23(4):349-364. PMID:
5. Majithia N, Smith TJ, Coyne PJ, et al. Scrambler Therapy for the management of chronic pain. *Support Care Cancer.* 2016;24(6):2807-2814. doi:10.1007/s00520-016-3177-3
6. Smith TJ, Auwaerter P, Knowlton A, Saylor D, McArthur J. Treatment of human immunodeficiency virus-related peripheral neuropathy with Scrambler Therapy: a case report. *Int J STD AIDS.* 2017 Feb;28(2):202-204. doi: 10.1177/0956462416656688. Epub 2016 Jul 10. PMID: 27330020.
7. Mealy MA, Newsome SD, Kozachik SL, Levy M, Smith TJ. *Case Report*: Scrambler Therapy for Treatment-Resistant Central Neuropathic Pain in a Patient with Transverse Myelitis. *Int J MS Care.* 2019 Mar-Apr;21(2):76-80. doi: 10.7224/1537-2073.2017-083. PMID: 31049038; PMCID: PMC6489430.
8. Mealy MA, Kozachik SL, Cook LJ, Totonis L, Salazar RA, Allen JK, Nolan MT, Smith TJ, Levy M. Scrambler therapy improves pain in neuromyelitis optica: A randomized controlled trial. *Neurology.* 2020 May 5;94(18):e1900-e1907. doi: 10.1212/WNL.0000000000009370. Epub 2020 Apr 8. PMID: 32269109; PMCID: PMC7274926.
9. Loprinzi C, Le-Rademacher JG, Majithia N, McMurray RP, O'Neill CR, Bendel MA, Beutler A, Lachance DH, Cheville A, Strick DM, Black DF, Tilburt JC, Smith TJ. Scrambler therapy for chemotherapy neuropathy: a randomized phase II pilot trial. *Support Care Cancer.* 2020 Mar;28(3):1183-1197. doi: 10.1007/s00520-019-04881-3. Epub 2019 Jun 17. PMID: 31209630.

10. D'Amato SJ, Mealy MA, Erdek MA, Kozachik S, Smith TJ. Scrambler Therapy for the Treatment of Chronic Central Pain: A Case Report. *A A Pract.* 2018 Jun 15;10(12):313-315. doi: 10.1213/XAA.0000000000000695. PMID: 29293482.
11. Christo PJ, Kamson DO, Smith TJ. Treatment of Déjerine-Roussy syndrome pain with scrambler therapy. *Pain Manag.* 2020 May;10(3):141-145. doi: 10.2217/pmt-2019-0065. Epub 2020 May 12. PMID: 32394815.
12. Starkweather AR, Coyne P, Lyon DE, Elswick RK Jr, An K, Sturgill J. Decreased low back pain intensity and differential gene expression following Calmare®: results from a double-blinded randomized sham-controlled study. *Res Nurs Health.* 2015 Feb;38(1):29-38. doi: 10.1002/nur.21632. Epub 2015 Jan 8. PMID: 25572279.
13. Smith TJ, Marineo G. Treatment of Postherpetic Pain With Scrambler Therapy, a Patient-Specific Neurocutaneous Electrical Stimulation Device. *Am J Hosp Palliat Care.* 2018 May;35(5):812-813. doi: 10.1177/1049909113494002. Epub 2013 Jul 8. PMID: 23838448.

Figures

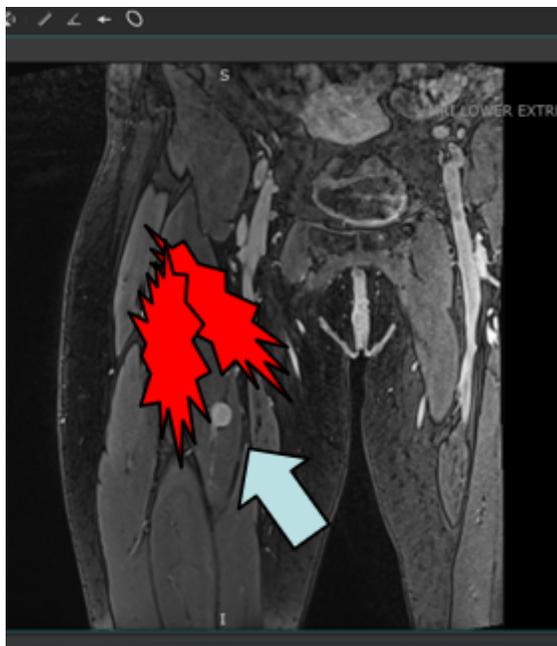


Figure 1

location of the most visible schwannoma and sites of pain

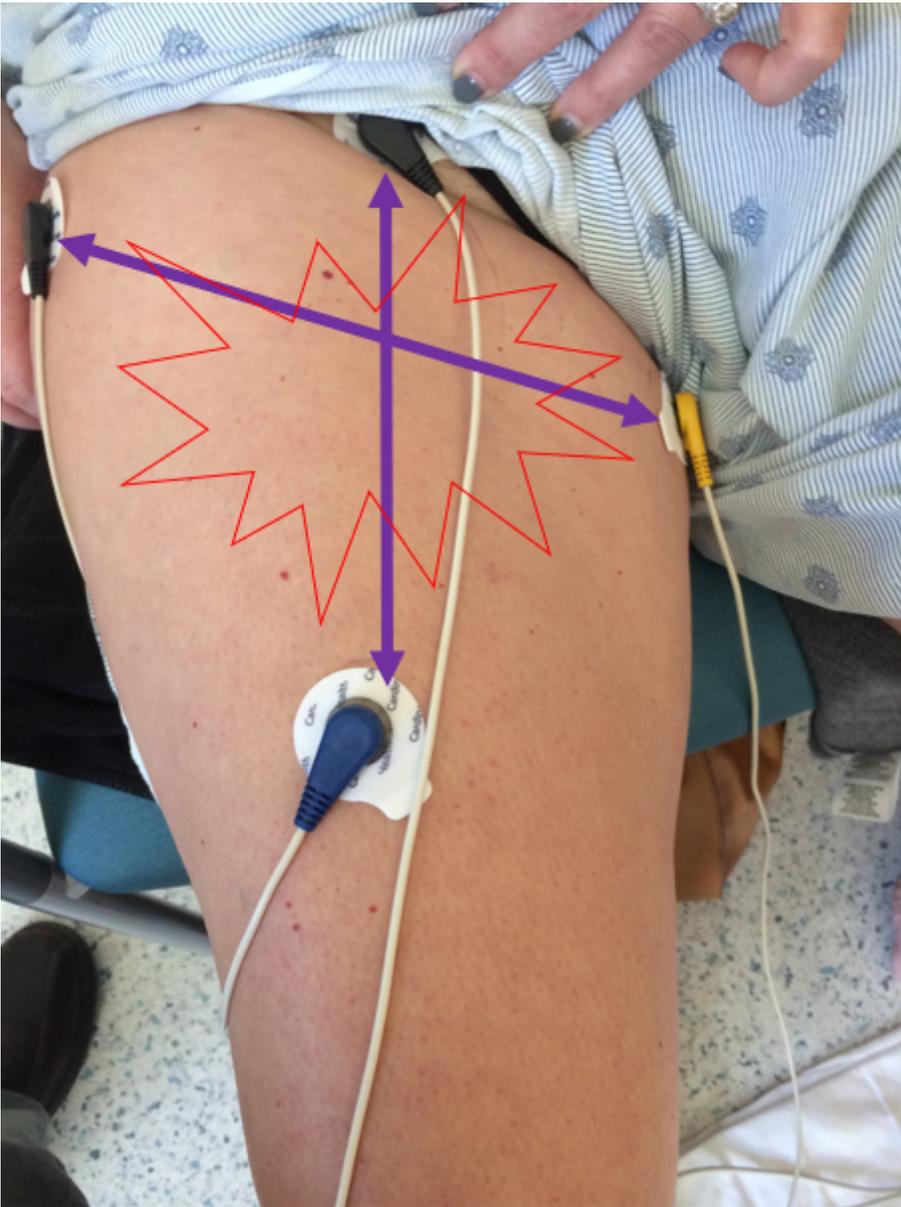


Figure 2

Placement of Scrambler Therapy Electrodes, each about 2 cm beyond the area of pain

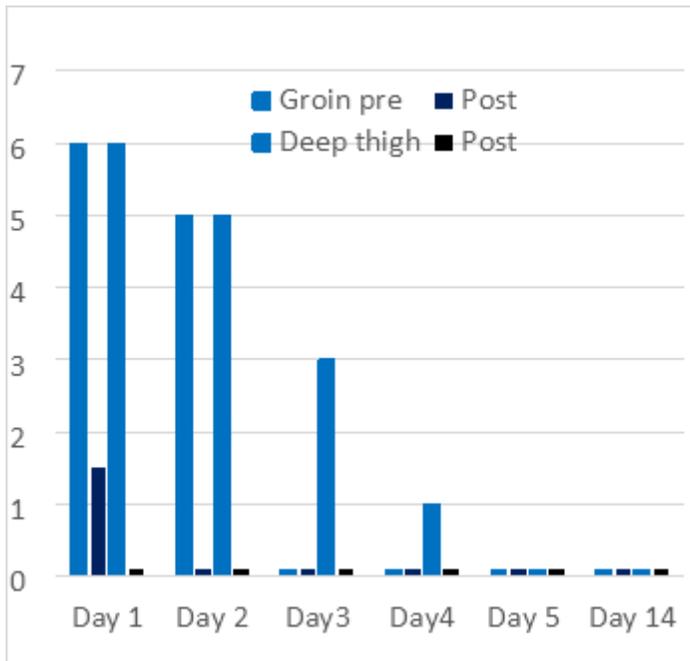


Figure 3

Pain response to Scrambler Therapy (0 is represented as 0.1 to show on the graph)