



Case Study

Closed-loop Spinal Cord Stimulator for Neuropathic Pain Complicating Chemotherapy Regimen

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Citation: Parker JL, Mena S, Mekhail N (2024) Closed-loop Spinal Cord Stimulator for Neuropathic Pain Complicating Chemotherapy Regimen. J Surg 9: 11014 DOI: 10.29011/2575-9760.11014

Received Date: 10 March 2024; Accepted Date: 15 March 2024; Published Date: 18 March 2024

Abstract

This case study examines a 48-year-old female with a history of breast cancer treated with neoadjuvant chemotherapy who presented to Cleveland Clinic with debilitating low back pain. Her pain was refractory to extensive therapeutic interventions, emphasizing the challenge in treating Chemotherapy-Induced Neuropathy (CIN). A comprehensive evaluation at Cleveland Clinic led to the diagnosis of CIN, prompting consideration of a closed-loop Spinal Cord Stimulator (SCS). The SCS trial provided the patient with 80% pain relief (VAS 10→2) as well as functional improvements. Permanent SCS implantation with close follow-up revealed significant, durable pain relief with sustained improvements in quality of life. This case suggests that a closed-loop SCS may serve as a promising modality for refractory CIN, offering analgesic relief and enhancing quality of life. Further cohort studies are warranted to substantiate the broader impact and generalizability of SCS in managing chemotherapy-induced neuropathy. This successful application underscores the potential of closed-loop SCS in alleviating chronic neuropathic pain in cancer survivors.

Keywords: Cancer survivor; Cancer treatment aftermath; Chemotherapy-induced neuropathy; Chronic pain, Interventional pain therapy; Closed-loop Spinal Cord Stimulator; Neuropathic pain; Pain management; Quality of life; Refractory pain

Introduction

Chemotherapy-Induced Neuropathy (CIN) is a disease process caused by chemotherapeutic agents that damage the peripheral nerves of the body. Patients will often experience numbness, tingling, or burning pain in different parts of their body without objective findings. CIN therefore presents a formidable challenge in pain management as these clinical symptoms present in non-traditional pain patterns making both diagnosis and treatment difficult.

Case Study

A 48-year-old female with a past medical history of breast cancer was referred to the Cleveland Clinic Foundation's Pain

Management clinic in 2021 for evaluation of radiating low back pain. Her pain began in October 2015 following multiple chemotherapy sessions for infiltrating ductal carcinoma of her right breast. She received neoadjuvant chemotherapy after which she began noticing burning and tingling in her back with radiation into her lower feet. The pain was worse when standing and walking, but improved while lying down, which left her bedridden for several days after moderate activity. When she went out for a walk, she could only walk one to two blocks before experiencing this severe, radiating low back pain into her feet.

After completing her chemotherapy in January 2016, she underwent bilateral mastectomies with breast implants the following month, but her debilitating pain continued. Over the next several years, she tried multiple therapeutic modalities from outside providers and specialists without relief. Her pain was refractory to both injections – epidural steroid injections, medial branch blocks, and trigger point injections – as well as most analgesic medications including opioids, NSAIDs, antidepressants, anticonvulsants,

low-dose naltrexone, muscle relaxants, CBD balm, massage, acupuncture, and chiropractor treatments. She was not a candidate for surgery after further evaluation by a Neurosurgeon. With few other options, she came to the Cleveland Clinic seeking pain relief.

History and physical examination demonstrated pain over non-contiguous dermatomes (L1-2, L5, and S2). Her pain was reproduced in flexion while her strength and deep tendon reflexes were within normal limits. She had an unremarkable Electromyogram performed in November of 2017 while her lumbar MRI in 2019 showed no significant pathology to explain her symptoms. Based on her history and physical, she was diagnosed with CIN. Given these findings and her refractory treatment modalities, the decision was made to evaluate her for a closed-loop spinal cord stimulator (SCS) trial.

Following this visit to Cleveland Clinic, she received a full psychological evaluation and assessment for a closed-loop Spinal Cord Stimulator (SCS). After a successful evaluation, she received a SCS trial that was implanted in December of that year with 80% relief of her pain severity (VAS 10→2). She also experienced functional improvements in her daily routine that boosted her quality of life and well-being; she could walk farther distances and stand long enough to do the dishes, which had been impossible before. With much anticipation, she underwent the permanent implantation of a closed-loop SCS implant in January 2022. The patient had close follow-up in the clinic showing significant, durable pain relief at one year. She was able to perform all activities of daily living including bending and lifting activities at work as well as walk 4 or more blocks without pain. She noted improved sleep quality and overall satisfaction with her daily routine without requiring any opioid medications.

Discussion

The patient in this case experienced debilitating pain that was refractory to most treatment modalities, highlighting the challenges associated with treating CIN. This case study offers a potential indication for a closed-loop SCS in addressing refractory neuropathic pain after chemotherapy. In this patient's case, traditional analgesic approaches proved insufficient and there were no surgical options that could be offered. Closed-loop SCS may therefore offer benefits, particularly when other treatment modalities have been exhausted. It may provide this patient population with improvements in pain severity, functional status, and quality of life. As research in neuromodulation advances, the implications of this case warrant further exploration in larger cohort studies to delineate the impact of closed-loop SCS in the context of CIN.

Conclusion

This case illustrates the successful application of closed-loop spinal cord stimulation as a viable and effective treatment modality for refractory CIN. This device has the potential to provide substantial pain relief, improve functionality, and enhance the patient's quality of life underscoring its potential as an option for managing chronic neuropathic pain in individuals with a history of cancer.