PAIN MEDICINE CASE REPORTS

ISSN 2768-5152
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Volume 10, Number 8, pp. 711-714

Successful Reduction of Excessive Polypharmacy in Chronic Neuropathic Pain Using Spinal Cord Stimulation and Exercise Therapy: A Case Report

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Background: Chronic pain is frequently associated with polypharmacy, increasing the risk of adverse events and poor adherence.

Case Report: We report a 50-year-old woman with refractory neuropathic pain following cellulitis, complicated by extensive polypharmacy (24 medications) and multiple adverse effects. An inpatient spinal cord stimulation (SCS) trial combined with structured walking exercise rapidly reduced pain intensity (Numeric Rating Scale: 7 to 1), enabling systematic deprescribing. Permanent implantation was not performed, as pain control was maintained after lead removal. At discharge, medications were reduced to 9, with sustained improvement over 9 months.

Conclusions: Our case suggests that short-term SCS may serve as a bridge therapy to facilitate deprescribing and functional recovery in patients with complex chronic pain and polypharmacy.

Key words: Chronic pain, polypharmacy, spinal cord stimulation, shared decision-making, case report

BACKGROUND

Polypharmacy, commonly defined as the use of 5 or more medications, is associated with increased risks of adverse drug reactions, medication errors, and poor adherence (1-3). Chronic pain is a multidimensional condition often accompanied by insomnia, anxiety, and depression, frequently resulting in polypharmacy (3). Excessive polypharmacy (≥ 10 medications) further increases the risk of adverse outcomes (3).

The World Health Organization emphasizes the importance of reducing inappropriate polypharmacy through systematic medication review and deprescribing (4). Nonpharmacological strategies, including neuromodulation and exercise therapy, are increasingly recognized as key components of multimodal pain management.

Spinal cord stimulation (SCS) is an established treatment for refractory neuropathic pain (5). While typically followed by permanent implantation, temporary SCS may also facilitate transition to less intensive treatment strategies. We report a case in which short-term SCS combined with exercise therapy enabled successful deprescribing and long-term stabilization without permanent implantation.

CASE PRESENTATION

Our report was prepared in accordance with the CARE guidelines. The patient was a 50-year-old woman with a

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Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.
Patient consent for publication: Consent obtained directly from patient(s).
This case report adheres to CARE Guidelines and the CARE Checklist has been provided to the journal editor.
Accepted: 2026-06-17, Published: 2026-10-31

complex medical history, including alcohol dependence treated at a psychiatric hospital, prior right thoracic outlet syndrome surgery, a right median nerve sheath tumor, heart failure due to Graves' disease, lumbar disc herniation, cervical spondylosis, and chronic insomnia. She sustained a fall that injured the lateral aspect of her left thigh, followed by cellulitis in the same region. Although the infection resolved, persistent pain remained in the left lower limb.

The pain was localized to the lateral left thigh and described as burning and tingling, with a Numeric Rating Scale (NRS-11) score between 6 and 10. The distribution corresponded to the lateral femoral cutaneous nerve. Neurological examination revealed hypoesthesia and allodynia, and a diagnostic nerve block provided temporary but clear relief, supporting a diagnosis of localized neuropathic pain.

At presentation, she was taking 24 medications (22 oral, 2 topical) prescribed by multiple providers, including 6 analgesics and 7 psychotropic or hypnotic agents, benzodiazepines (bromazepam, nitrazepam, flunitrazepam, diazepam, and lorazepam), suvorexant, and chlorpromazine. Additional drugs addressed gastrointestinal protection, constipation, heart failure, thyroid dysfunction, and electrolyte imbalance (Tables 1 and 2). Medication management was primarily conducted by a home care nurse. The patient reported dizziness, gait disturbance, daytime somnolence, and poor appetite, suggesting adverse effects related to polypharmacy.

Physical examination showed gait instability and edema of the left lower leg. Cardiac and venous causes were excluded clinically and through laboratory findings, and the edema was attributed to disuse. Magnetic resonance imaging demonstrated hypertrophic scarring from prior cellulitis extending from the lateral thigh to the vastus lateralis, consistent with the painful region. Due to refractory neuropathic pain and polypharmacy-related adverse effects, she was admitted for inpatient management.

An SCS trial was performed. A percutaneous electrode (Medtronic, Minneapolis, MN) was inserted via the Th12/L1 interlaminar space and positioned with the tip at the left Th9 level (Fig. 1). Tonic stimulation (50 Hz, 300 μs) produced paresthesia overlapping the painful area. Within one day, the NRS-11 score decreased from 7 to 1 and remained generally low throughout the 21-day trial period, although some day-to-day variation was observed. Although the trial met success criteria, permanent implantation was deferred after shared decision-making (Fig. 2).

Concurrently, structured walking-based exercise therapy was initiated using the frequency, intensity, time, and type (FITT) principle, targeting 5,000 steps per day. By discharge, the patient achieved this goal, with improved gait stability, resolution of edema, and better sleep and bowel function.

A structured deprescribing strategy was implemented, reviewing medications for indication, efficacy, and risk (6). Sedative agents, including benzodiazepines, were gradually reduced without significant withdrawal except for transient insomnia, while key agents, such as mirogabalin and duloxetine, were maintained (Table 2). Five days before discharge, SCS leads were removed after increasing mirogabalin. Pain did not recur, and NRS-11 scores remained low (Fig. 2).

At discharge, medications were reduced from 24 to 9. Pain relief and functional improvements were sustained over 9 months without medication escalation.

DISCUSSION

Our case highlights a potentially important role of SCS as a transitional or enabling therapy in patients with complex chronic neuropathic pain complicated by polypharmacy. Although SCS is typically used as a long-term implantable treatment after failure of conventional therapies, in this patient it functioned as a short-term neuromodulatory intervention that rapidly reduced pain intensity. This created a therapeutic window that enabled safe and effective deprescribing. These findings suggest that SCS may serve as a "bridge therapy," facilitating a shift from medication-dependent management to a more sustainable and simplified treatment approach.

The rapid analgesic effect observed during the SCS trial was clinically meaningful, with pain scores decreasing from severe to minimal levels within one day. This rapid reduction in pain strongly suggests a primary effect of SCS; whereas, sustained improvement after lead removal likely reflects the combined effects of exercise therapy and optimized pharmacotherapy. This improvement likely allowed reduction of sedative and centrally acting medications that had been required for symptom control. Despite meeting criteria for permanent implantation, the patient did not undergo device placement because pain control was maintained after lead removal. This challenges the conventional paradigm that a successful SCS trial should routinely lead to implantation and suggests that short-term use may be sufficient in selected patients (7). This approach

Table 1. Medication regimen at presentation. The table lists analgesics, antipsychotics/hypnotics, and other medications for comorbid conditions, including total daily doses and number of tablets/capsules, demonstrating the complexity of the initial polypharmacy regimen.

Category	Medication	Daily Dose
Analgesics	Tramadol/ Acetaminophen	Tramadol 150 mg / Acetaminophen 1300 mg
	Diclofenac	75 mg
	Mirogabalin	7.5 mg
	Duloxetine	40 mg
	Fentanyl (transdermal)	3 mg
	Ketoprofen (topical)	40 mg
Sedatives / Psychotropics	Bromazepam	5 mg
	Nitrazepam	10 mg
	Suvorexant	20 mg
	Flunitrazepam	2 mg
	Chlorpromazine	25 mg
	Diazepam	15 mg
	Lorazepam	3 mg
Others	Omeprazole	10 mg
	Famotidine	40 mg
	Rebamipide	300 mg
	Bethanechol	90 mg
	Naldemedine	0.2 mg
	Magnesium oxide	660 mg
	Sodium picosulfate	25 drops
	Furosemide	40 mg
	Spironolactone	50 mg
	Levothyroxine	25 μg
	Potassium gluconate	3510 mg

Table 2. Medication regimen at discharge. The table shows the simplified medication regimen at discharge, demonstrating successful reduction from 24 medications (22 oral and 2 topical) to 9 medications, including four analgesics and one hypnotics.

Category	Medication	Daily Dose
Analgesics	Fentanyl (transdermal)	1 mg
	Mirogabalin	10 mg
	Duloxetine	40 mg
Sedatives	Flunitrazepam	1 mg
Others	Omeprazole	10 mg
	Naldemedine	0.2 mg
	Magensium oxide	660 mg
	Levothyroxine	25 μg
	Potassium gluconate	3510 mg

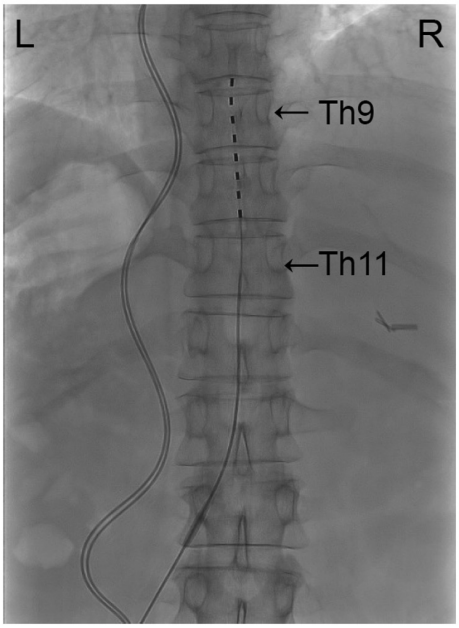


Fig. 1. Placement of SCS electrode. A percutaneous epidural electrode was inserted through the Th12/L1 interlaminar space, and the tip of the temporary lead was positioned at the Th9 vertebral level on the left side, corresponding to the ain distribution. SCS, spinal cord stimulation.

may be particularly applicable to patients with severe polypharmacy, functional decline, and a favorable response to SCS trial stimulation.

Sustained improvement after discontinuation of SCS underscores the importance of concurrent non-pharmacological interventions. Structured walking exercise, implemented according to the FITT principle, likely contributed to ongoing pain control through mechanisms, such as exercise-induced hypoalgesia and activation of descending inhibitory pathways (8-10). Increased physical activity also improved gait stability and overall function, while step-based targets supported adherence.

Deprescribing was another key component. The patient initially presented with extensive polypharmacy and multiple adverse effects. Following pain improvement, medications were systematically reviewed and high-risk agents, particularly benzodiazepines and opioids, were gradually tapered using shared decision-making. No significant withdrawal symptoms were observed except for transient insomnia, supporting

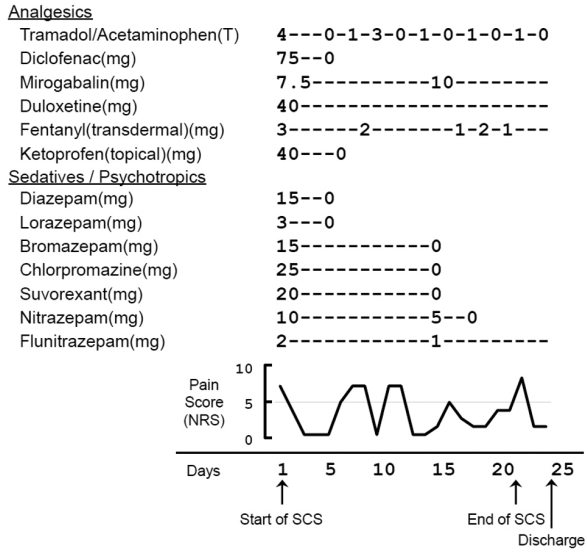


Fig. 2. Clinical course and pain intensity during hospitalization. A timeline showing the clinical course during hospitalization. The upper graph illustrates the gradual reduction of analgesics and antipsychotics/hypnotics over time. SCS therapy was initiated on the first day of hospitalization (Day 0) and discontinued before discharge. The lower line graph shows NRS-11 pain scores during hospitalization. The pain score decreased from 7 to 1 within one day after initiation of SCS and remained generally low throughout the 21-day trial period, although some day-to-day variation was observed. Only tramadol/acetaminophen listed by the number of tablets. SCS, spinal cord stimulation; NRS-11, Numeric Rating Scale; T, tablet.

the safety of gradual deprescribing in this setting. This resulted in reduced medication burden and improvement in adverse effects, such as dizziness and daytime somnolence.

Limitations include reliance on NRS-11 for pain assessment, lack of objective measures, and inability to isolate the effects of each intervention. As a single case, generalizability is limited.

CONCLUSIONS

Short-term SCS combined with exercise therapy and structured deprescribing may facilitate sustainable pain control and reduction of polypharmacy. This approach may be useful in selected patients with complex chronic pain.

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