Review

Comparative Efficacy of Dorsal Root Ganglion Versus Spinal Cord Stimulation in the Management of Complex Regional Pain Syndrome and Failed Back Surgery Syndrome: A Narrative Review

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Posted Date: 4 June 2025

doi: 10.20944/preprints202506.0323.v1

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Comparative Efficacy of Dorsal Root Ganglion Versus Spinal Cord Stimulation in the Management of Complex Regional Pain Syndrome and Failed Back Surgery Syndrome: A Narrative Review

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Abstract: Background: Complex Regional Pain Syndrome (CRPS) and Failed Back Surgery Syndrome (FBSS) are challenging neuropathic pain conditions often refractory to conservative treatment. Neuromodulation offers a promising solution, particularly with spinal cord stimulation (SCS) and dorsal root ganglion stimulation (DRG-S). **Objective:** This review compares DRG-S and SCS in CRPS and FBSS to evaluate their relative efficacy, safety, and clinical utility. **Methods:** A narrative literature review was conducted using peer-reviewed sources focusing on the use of DRG-S and SCS in CRPS and FBSS populations. **Results:** DRG-S offers enhanced targeting of focal pain areas in CRPS, while SCS provides broader coverage useful in FBSS. DRG-S demonstrates superior outcomes in CRPS regarding pain relief and functional improvement. Lead migration, a common complication in both, is reportedly lower in DRG-S. **Conclusion:** DRG-S is particularly effective in CRPS due to precise anatomic targeting, while SCS remains valuable in FBSS. Further randomized studies are needed to confirm long-term comparative efficacy.

Keywords: dorsal root ganglion stimulation; spinal cord stimulation; complex regional pain syndrome; failed back surgery syndrome; neuromodulation; lead migration; chronic pain

Introduction

Chronic neuropathic pain remains a major clinical challenge, especially in cases of CRPS and FBSS. These syndromes often resist conventional management, prompting the use of neuromodulation. SCS has been the standard for decades, but DRG stimulation has emerged as a more targeted alternative. This review explores the differences, clinical outcomes, and practical considerations of DRG-S vs. SCS in managing CRPS and FBSS.

Methods

We performed a non-systematic narrative review using PubMed and Google Scholar. Inclusion criteria focused on articles discussing DRG-S or SCS in the context of CRPS and FBSS, particularly randomized trials, cohort studies, and relevant reviews from 2015 onward. Studies were selected for clinical relevance, strength of evidence, and recency.

Discussion

DRG Stimulation Overview

DRG-S directly targets the dorsal root ganglion, a structure involved in pain signal modulation. This allows precise stimulation of affected dermatomes with lower stimulation thresholds and improved energy efficiency. It is particularly effective for focal pain, making it ideal for CRPS.

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SCS Overview

SCS delivers paresthesia-based stimulation to the dorsal columns, traditionally used for widespread pain syndromes like FBSS. While effective, lead migration and positional effects on paresthesia coverage limit its precision in CRPS.

Efficacy in CRPS

DRG-S showed superior pain reduction and quality-of-life outcomes in the ACCURATE trial compared to SCS in CRPS patients. Its ability to deliver selective dermatomal coverage makes it more suitable for localized pain syndromes.

Efficacy in FBSS

SCS remains widely used in FBSS, offering significant improvements in pain and function. DRG-S may be less commonly used in FBSS due to broader pain patterns, though emerging data suggest comparable efficacy when well-targeted.

Lead Migration and Complications

Lead migration is a concern in both methods, with DRG-S having lower reported migration rates. This may be due to the anatomical confinement of DRG compared to the epidural space.

Patient Selection and Future Directions

Patient-specific factors like pain location, previous surgeries, and psychological comorbidities should guide modality selection. Long-term comparative studies are needed, especially in FBSS populations.

Comparative Outcomes Table: DRG Stimulation vs. SCS

Feature	DRG Stimulation	Spinal Cord Stimulation (SCS)
Target	Dorsal root ganglion	Dorsal columns of spinal cord
Best Use Case	CRPS, focal neuropathic pain	FBSS, diffuse neuropathic pain
Precision	High (dermatomal targeting)	Moderate (broader field)
Lead Migration Rate	Lower	Higher
Paresthesia Independence	Yes (in newer systems)	Typically paresthesia-based
FDA-Approved Indications	CRPS types I & II	FBSS, CRPS, chronic trunk/limb pain
Major Clinical Trial	ACCURATE Trial	SENZA, SUNBURST, and others
Energy Efficiency	Higher	Lower
Overall CRPS Pain Relief	Superior to SCS	Less effective for focal CRPS
FBSS Outcomes	Comparable in select cases	More extensively studied in FBSS

Conclusions

DRG-S is highly effective for CRPS, offering targeted relief with fewer complications. SCS remains the preferred modality in FBSS but may benefit from adjunctive DRG use in select patients. With ongoing innovation and growing evidence, these therapies will continue to evolve the landscape of chronic pain management.

Author Contributions: I, Brendan Jones, conceptualized the review, conducted the literature search, synthesized the findings, and wrote the manuscript.

Funding: No external funding was received for this work.

Conflict of Interest: The author declares no conflicts of interest.

 doi:10.20944/preprints202506.0323.v1

Use of AI Tools: This manuscript was prepared with the assistance of AI language models to enhance clarity, grammar, and structure. All intellectual content, critical analysis, and interpretation of data remain the sole responsibility of the author.

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