Author Information

Full Names:
Dipan Patel, MD
Corey Hunter, MD

Affiliation:
Dipan Patel, MD: Garden State Pain Control, Clifton, New Jersey, USA

Corey Hunter, MD Attending Pain Physician, Ainsworth Institute for Pain Medicine, NY, NY, USA

Email Contacts:
Dipanpatelmd@gmail.com

Corey.hunter@me.com

Case Information: DORSAL ROOT GANGLION SPINAL CORD STIMULATION & POST HERPETIC NEURALGIA (PHN)

Presenting Symptoms: Burning, electrical, radiating pain

Case Specific Diagnosis: Post herpetic neuralgia (PHN)

Differential Diagnosis: PHN, Thoracic radiculopathy, HIV neuropathy, Intercostal neuralgia,

Learning Objectives:

• To understand PHN as an indication for SCS, specifically DRG-SCS in those patients with chronic refractory neuropathic pain secondary to PHN.

• To demonstrate the evidence for various forms of SCS for chronic neuropathic pain due to PHN as a potential option for treatment, and the appropriateness for utilizing one form of SCS over the other.

• Formulate differential diagnosis for PHN and identify available treatment options.

HPI:

A 48-year old Male with a PMH of HIV (1987) and Shingles (2002), presents to the pain clinic with chronic burning electric radiating pain from the mid back around to the left side/flank ending below the belly button since 2004. Patient reports occasional spasm occurs, denies numbness or weakness. Pain is worsened by contact/light touch, cold weather, stress, and white wine. Meditation and Tramadol has been the only alleviating factor. Severity reported as 7/10 on VRS scale. Patient reports having previous neurolysis of the thoracic nerve roots without improvement in pain. Denies gait abnormality, weight loss, fever/chills, night sweats, fecal incontinence or urinary incontinence.

Pertinent Physical Exam findings:

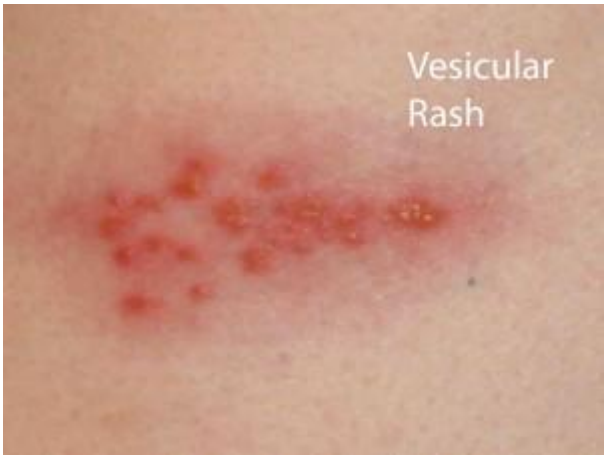
• +Allodynia & Hyperalgesia LEFT T12 dermatomal distribution.

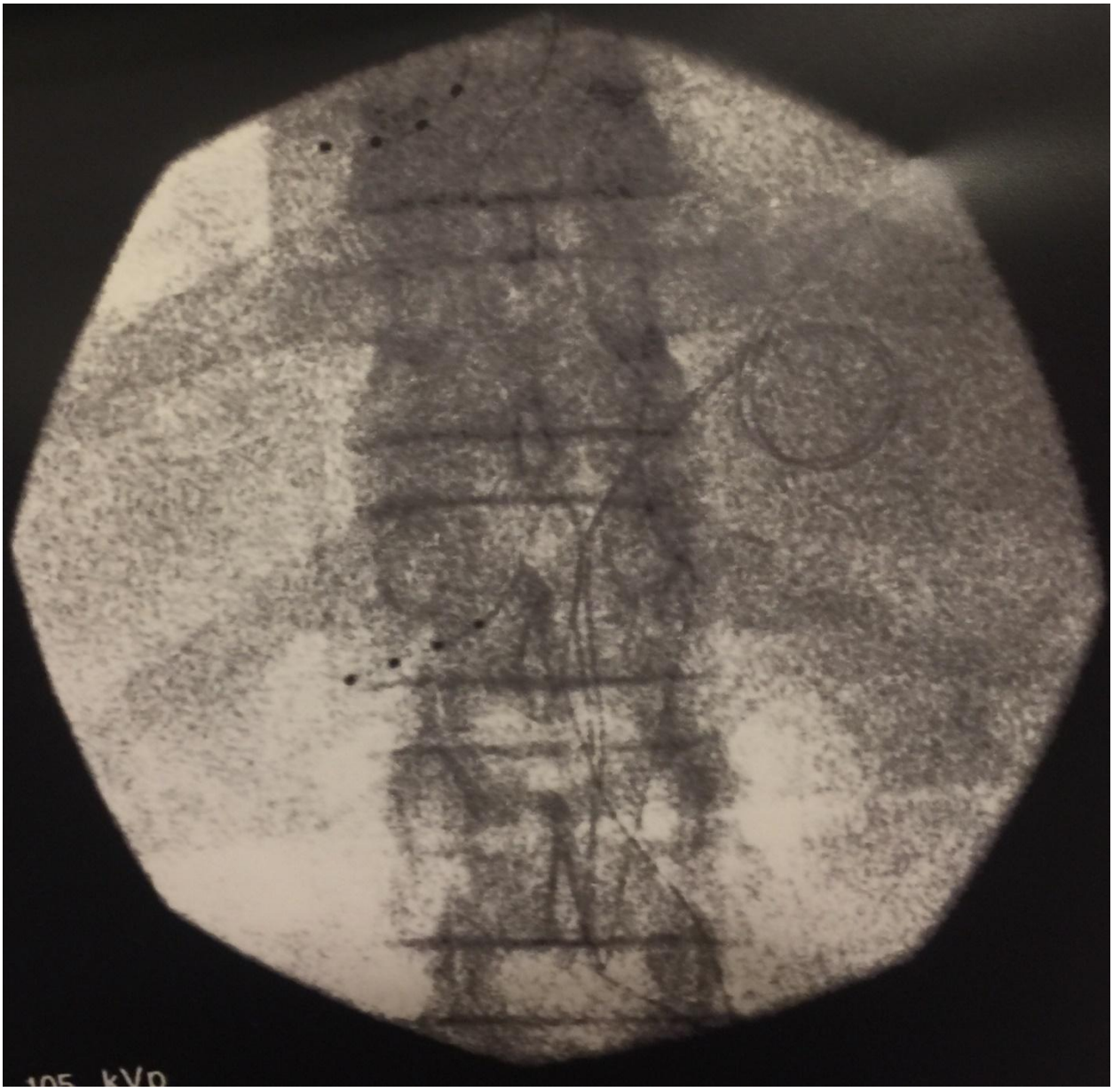
• Strength and sensation in BL LE

Diagnostic Imaging and results:

• CBC/CMP/Coagulation studies: WNL

MEDIA:





Differential Diagnosis:

• Post herpetic neuralgia

• Thoracic radiculopathy

• HIV Neuropathy

• Intercostal neuralgia

Medications and Interventions:

The patient's pain has remained refractory for many years to meditation, over the counter/topical analgesics, anti-neuropathic medications, thoracic nerve root neurolysis, thoracic transforaminal epidural steroid injections, Dorsal root ganglion pulsed rhizotomy, sympathetic nerve blocks, and TENS therapy which provided very mild and short-term relief. The patient is seeking improvement in pain relief that can ultimately lead to improvement in affect, function, and quality of life.

The patient had multiple interventional procedures which resulted in short term analgesic relief.

A decision to undergo DRG-SCS trial was determined by the patient in order to achieve long term analgesic relief.

Post herpetic neuralgia (PHN) is a neuropathic pain syndrome that is often intractable. PHN is defined as pain persisting for more than 6 months after rash healing of acute herpes zoster. Patients with PHN report constant burning, throbbing or arching pain, intermittent sharp, shooting pain and mostly tactile allodynia (1). The etiology of pain is due to reactivation of dormant varicella-zoster virus, which typically occurs in elderly or immunodeficient individuals. The virus initiates an inflammation of **sensory ganglia** and peripheral nerves, inducing abnormal nociceptor sensitization and central hyperexcitability (2,3). In some patients, pain persists for months, years, or indefinitely after healing of the shingles lesions.

The pain pattern demonstrated by the patient most likely is a result of PHN resulting from shingles developed in 2002. The patient did not have any significant soft tissue spinal defects to consider the major pain source to be thoracic radiculopathy. In addition, the patient had no previous malignancy history or surgical history that could have led to potential thoracic intercostal neuralgia. Finally, the patient's HIV viral load was well controlled and no other neuropathy was demonstrated by the patient.

Therefore, given the history of shingles and chronic refractory neuropathic pain following a dermatomal distribution the most likely underlying mechanism of the presenting illness was confirmed to be PHN. The next best step in the process is to determine lead placement for DRG-SCS.

In order to plan lead placement for DRG-SCS trial a LEFT T10, 11, 12 selective nerve root block was performed in order to determine the exact levels affected. **The positive level was determined to be T11.**

In order to provide pain relief while the patient was awaiting DRG-SCS trial, multilevel thoracic ESI was performed in order to achieve short term relief at the LEFT T10-11, 11-12 and T12-L1 levels in order to target the T10,11, and 12 nerve roots.

Subsequently the patient underwent DRG-SCS stimulation with lead placement in the LEFT T10 and T12 neural foramen to specifically target the DRG without interfering and disrupting the affected level where the zoster virus is dormant.

The patient after trial received 60% pain relief and improvement in function without adverse events/effects of therapy thereby meeting criteria for permanent device implantation.

Evidence Based Indications for SCS in PHN:

Efficacy:

Evidence regarding traditional dorsal column SCS for PHN is limited with conflicting evidence after performing a literature search.

In a 2002 study by Harke et al 23 of 28 patients with postherpetic neuralgia and 4 of 4 with acute herpes zoster whose chronic pain was improved by electrical spinal cord stimulation (1). A major finding of this study is the favorable long term outcome of SCS after a follow up at 29 months showing 82% of patients responded favorable to SCS therapy. However, after further literature review previous evidence showed that the response for PHN to SCS was less predictable ranging from 27-60% (4-7). Patients who failed to respond hypothetically some extent of deafferentation and degeneration of the dorsal column fibers and would experience no change of pain with SCS.Additionally, Kumar et al. (1996) noted only 38% of patients were relieved of pain after SCS and after seven year follow up only 25% continued to experience analgesia (8).

Given the limited impactful data with traditional dorsal column SCS, excitement for the long term treatmentof various neuropathic pain syndromes including PHN spiked after news releasedintroducing Dorsal Root Ganglion SCS therapy and its supporting evidence surrounding the management of neuropathic pain.

In the 2015 edition of Neuromodulation a study published by Liem et al supported the evidence for the use of DRG SCS in the treatment of chronic neuropathic pain. Spinal cord stimulation of the dorsal root ganglion (DRG-SCS) was introduced as a new therapy for treating chronic neuropathic pain. Previous work has demonstrated the effectiveness of DRG-SCS for pain associated with failed back surgery syndrome, complex regional pain syndrome (CRPS), chronic postsurgical pain, and other etiologies through 6 months of treatment; the report describes the maintenance of pain relief, improvement in mood, and quality of life through 12 months.

Subjects with intractable pain in the back and/or lower limbs were implanted with an active neurostimulator device. Up to four percutaneous leads were placed epidurally near the DRG. Subjects were tracked prospectively for 12 months.

Overall, pain was reduced by 56% at 12 months post-implantation, and 60% of subjects reported greater than 50% improvement in their pain. Pain localized to the back, legs, and feet was reduced by 42%, 62%, and 80%, respectively. Measures of quality of life and mood were also improved over the course of the study, and subjects reported high levels of satisfaction. Importantly, excellent pain-paresthesia overlap was reported, remaining stable through 12 months (9).

Despite methodological differences in the literature, DRG-SCS appears to be comparable to traditional SCS in terms of pain relief and associated benefits in mood and quality of life. **Its benefits may include the ability to achieve precise pain-paresthesia concordance, including in regions that are typically difficult to target with SCS (like PHN), and to consistently maintain that coverage over time.**

The ACCURATE study published by Deer et al. also paved the way for the use of DRG SCS for PHN given its positive data at 12 months. The latest publication in Pain highlights both three-month and 12-month data from the ACCURATE study, the largest study to date evaluating patients suffering from chronic lower limb pain associated with CRPS. The 12-month data were previously presented at the 19th annual meeting of the North American Neuromodulation Society (NANS) in Las Vegas, Nevada, in December 2015 and the three-month primary endpoint data were originally presented at the International Neuromodulation Society (INS) annual meeting in June 2015.

The ACCURATE study showed that after both three and 12 months, DRG stimulation therapy offered patients:

Sustained and superior pain relief: After 12 months, a statistically significant number of patients receiving DRG stimulation achieved meaningful pain relief and greater treatment success when compared to patients receiving traditional SCS (74.2 percent vs. 53.0 percent).

Secondary endpoint data suggested:

Reduced paresthesia: At 12 months, more than a third of patients who received DRG stimulation were experiencing greater than 80 percent pain relief with no paresthesia. (Paresthesia is a light tingling sensation often accompanying traditional tonic spinal cord stimulation.)

Improvements in quality of life: At 12 months, DRG patients had statistically greater improvements in their physical component ($p=0.04$), general health ($p=0.03$) and social functioning ($p=0.03$) when compared to SCS subjects (10).

In order to determine the ideal lead placement for DRG SCS leads in the management of PHN it is best to avoid the diseased level in order to avoid inadvertent reaction of the virus.

The evidence for DRG SCS is still being collected and DRG SCS is still considered “investigational” by third party payers.

In the event of equivocal result from selective nerve root blocks, a 2017 study by Hunter et al, showed that mapping of the DRG via RF stimulation appears to provide improved accuracy for determining lead placement where pain patterns are known to deviate from conventional dermatomal mapping (11).

References:

1. Harke, Henning et al. "Spinal Cord Stimulation In Postherpetic Neuralgia And In Acute Herpes Zoster Pain." Anesthesia & Analgesia, vol 94, no. 3, 2002, pp. 694-700. Ovid Technologies (Wolters Kluwer Health), doi:10.1097/00000539-200203000-00040.

2. Rowbotham, Michael C., and Karin L. Petersen. "Zoster-Associated Pain And Neural Dysfunction." Pain, vol 93, no. 1, 2001, pp. 1-5. Ovid Technologies (Wolters Kluwer Health), doi:10.1016/s0304-3959(01)00328-1.

3. Gnann JW Jr, Whitley RJ: “Herpes zoster”. New England Journal of Medicine. 2002; 347:340-346

4. Shimoji, Koki et al. "Management Of Intractable Pain With Percutaneous Epidural Spinal Cord Stimulation." Anesthesia & Analgesia, vol 77, no. 1, 1993, pp. 110???116. Ovid Technologies (Wolters Kluwer Health), doi:10.1213/00000539-199307000-00022.

5. Simpson, B A. "Spinal Cord Stimulation In 60 Cases Of Intractable Pain.." Journal Of Neurology, Neurosurgery & Psychiatry, vol 54, no. 3, 1991, pp. 196-199. BMJ, doi:10.1136/jnnp.54.3.196.

6. Meglio, M. et al. "Spinal Cord Stimulation (SCS) In Deafferentation Pain." Pacing And Clinical Electrophysiology, vol 12, no. 4, 1989, pp. 709-712.Wiley-Blackwell, doi:10.1111/j.1540-8159.1989.tb02720.x.

7. Spiegelmann, R, and W A Friedman. "Spinal Cord Stimulation." Neurosurgery, 1991, p. 65. Oxford University Press (OUP), doi:10.1097/00006123-199101000-00011.

8. Kumar, Krishna et al. "Spinal Cord Stimulation For Chronic Pain In Peripheral Neuropathy." Surgical Neurology, vol 46, no. 4, 1996, pp. 363-369. Elsevier BV, doi:10.1016/s0090-3019(96)00191-7.

9. Liem, Liong et al. "One-Year Outcomes Of Spinal Cord Stimulation Of The Dorsal Root Ganglion In The Treatment Of Chronic Neuropathic Pain." Neuromodulation: Technology At The Neural Interface, vol 18, no. 1, 2014, pp. 41-49. Wiley-Blackwell, doi:10.1111/ner.12228.

10. Deer, Timothy R. et al. "Dorsal Root Ganglion Stimulation Yielded Higher Treatment Success Rate For Complex Regional Pain Syndrome And Causalgia At 3 And 12 Months." PAIN, vol 158, no. 4, 2017, pp. 669-681. Ovid Technologies (Wolters Kluwer Health), doi:10.1097/j.pain.0000000000000814.

11. Hunter, Corey W. et al. "Selective Radiofrequency Stimulation Of The Dorsal Root Ganglion (DRG) As A Method For Predicting Targets For Neuromodulation In Patients With Post Amputation Pain: A Case Series." Neuromodulation: Technology At The Neural Interface, vol 20, no. 7, 2017, pp. 708-718. Wiley-Blackwell, doi:10.1111/ner.12595.