



# **The Role of Combining Spinal Cord Stimulation and Intrathecal Drug Delivery for Chronic Pain**

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## Title & Affiliation

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# Disclosure

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- Consultant/Independent Contractor: Abbott, Nalu Medical
- Grant/Research Support: Abbott
- Speaker's Bureau: Abbott

# Learning Objectives

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- Describe the concept of combination therapy in neuromodulation
- Discuss the need for salvage therapy based on the characteristics of the chronic pain disease state
- List the benefits and challenges of dual neuromodulation therapy for the patient and the provider
- Describe future opportunities of combining therapy

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery

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- Which to Choose First?
- More than one “school of thought”
- Patient tailored needs
- Pain care “algorithm”

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery

*Pain Medicine*, 20, 2019, S2–S12

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**Review Article**

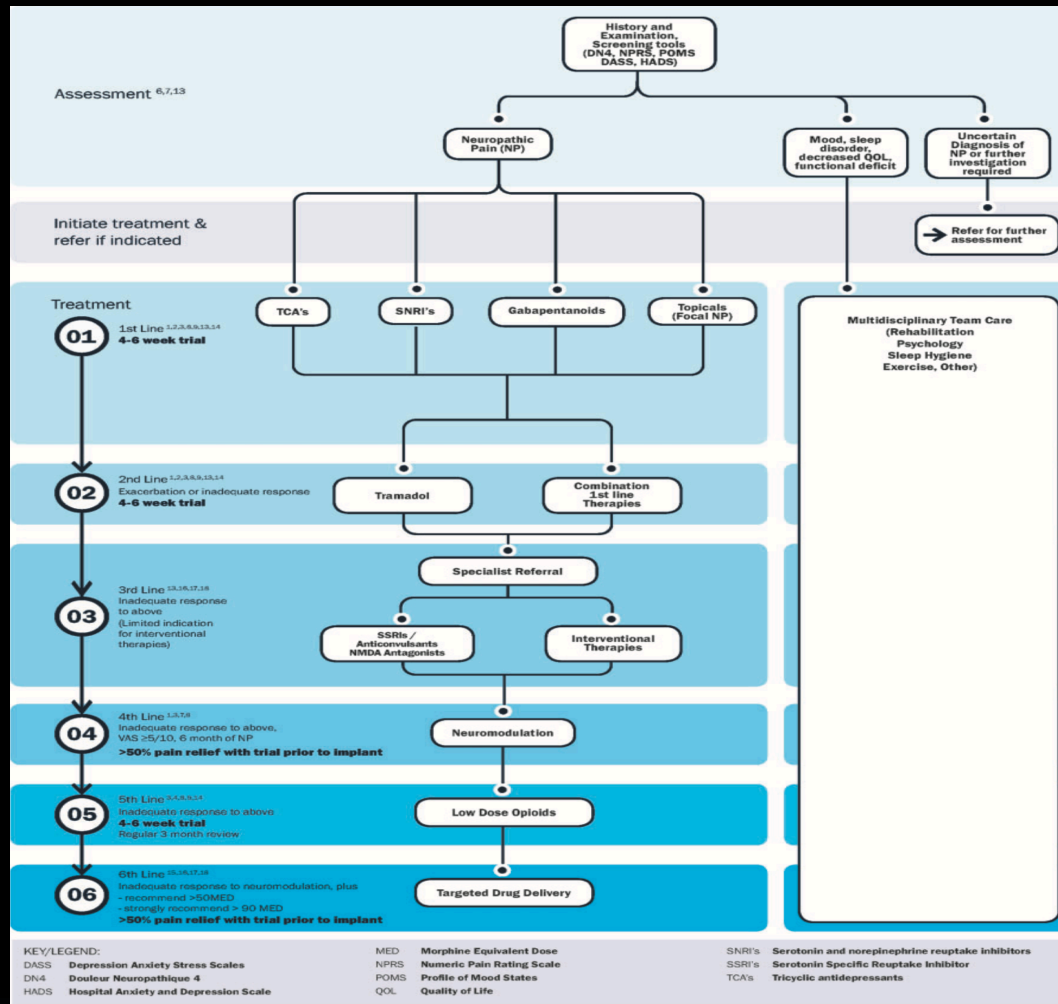
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## REVIEW ARTICLES

### A Comprehensive Algorithm for Management of Neuropathic Pain

Daniel Bates, MD,\* B. Carsten Schultheis, MD, PhD,<sup>†</sup> Michael C. Hanes, MD,<sup>‡</sup> Suneil M. Jolly, MD,<sup>§,¶</sup> Krishnan V. Chakravarthy, MD, PhD,<sup>||,|||</sup> Timothy R. Deer, MD,\*\* Robert M. Levy, MD, PhD,<sup>††</sup> and Corey W. Hunter, MD<sup>‡‡</sup>

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery



- Bates et al. (1)
- Ideal Scenario of Approach
- A Majority Present with a Mixture of Treatment Lines 1-5
- The Early Use of Opioids by Providers Prior to Referral for Neuromodulation Complicates Choice for IDD vs SCS (Maybe - Disease State?)

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery – Initial Choice?

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# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery- Initial Choice

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- Patient factors to consider
  - Type of Pain: Nociceptive vs. Neuropathic vs. Mixed
  - Patient Comorbidities: Diabetes, Renal Disease, Central Nervous System disease
  - Patient Surgical Eligibility: Current State and Future
  - Historical Use of Medications: Non-opioid and Opioid/opiate
  - Patient Psychosocial Dynamics: History of Substance Abuse, Patient Engagement, Reliability, Compliance
  - Patient Projected Lifespan
- Device Factors:
  - Burden of Therapy: Internal Pulse Generator "maintenance," Intrathecal Drug Delivery Reservoir Filling, MRI Compatibility and Future Needs, Potential for Pain of Implanted Hardware

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: Data

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- There is no prospective level 1 data to support combination SCS/IDD therapy
- Salvage Therapy – The use of IDD following failed SCS trial or SCS implant
  - Approach to salvage therapy is without consensus
    - New Waveforms vs Target Drug Delivery (3)
      - Advantage to SCS: Variety of paresthesia-free patterns and unlimited combinations
      - Advantage to IDD: Neurophysiological advantage of many on- and off-label drugs with wide ranging mechanisms of action
      - Disadvantage to both: Habituation or Tolerance of the CNS
    - Dorsal root ganglion therapy salvage of focal / regional pain (T10 and below)
- Dual therapy may be best proposed as patients develop new or advancing conditions that are new processes or a sequelae of existing disease states.

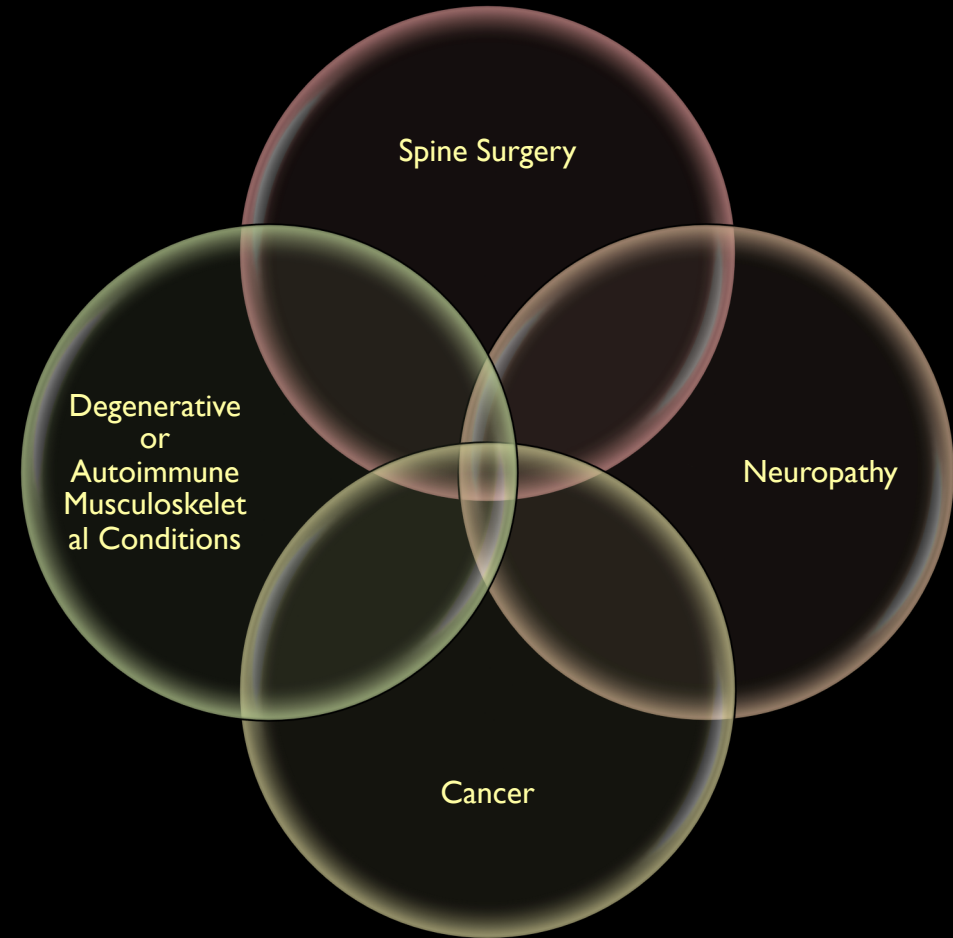
# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery- Data

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- Mekhail et al. (2) retrospective chart review 945 patients with success vs. failure of SCS and failures that proceeded to IDD
- Males 52% less likely to succeed with SCS, decreasing 6% per year
- Co-morbid depression patients were 63% more likely to succeed with SCS
- Success of SCS decreased 6% per year
- Older male patients with spine related diagnoses were more likely to benefit from IDD than SCS \*
  - pain treatment algorithm may not apply in this sub - group

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Changes over time*

- Changes over time will indicate tailored therapy
- SCS and IDD may be indicated at different points in a patient's lifespan



# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Case Study*

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- 64-year-old male patient incurs an accident that resulted in temporary loss of consciousness and a crush injury of the left hand at work. Over the course of 6 months, the patient develops swelling, hypersensitivity and erythema of the hand despite ongoing physical therapy, NSAIDs, gabapentin, and oxycodone. An EMG was later performed and significant for damage of the radial and ulnar nerves. Stellate ganglion blocks proved effective to reduce pain for approximately one week by 50% reduction in pain score.
- What is the patient's diagnosis?
- What would the best next step be?

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Case Study*

- Some years later, the patient has developed chronic contracture of the left extremity. Swelling, skin and nail changes persisted. He is now significantly depressed despite SNRI therapy
- Cervical spinal cord stimulation was effective in reducing pain by 50%, but mechanical allodynia progressed proximally to the shoulder.
- How would you manage this patient?



# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Case Study*

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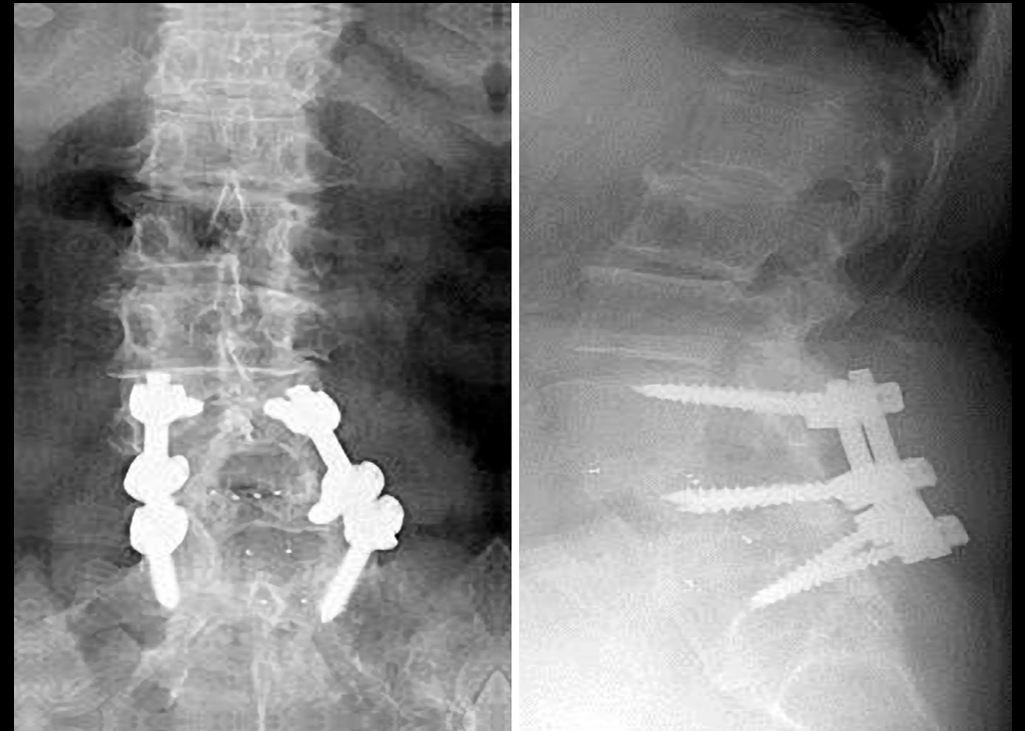
- The patient was treated with a series of ketamine infusions
- After two treatments, the patient's swelling and pain improved transiently for a few months.
- What is the role of ketamine in chronic pain states? (5)





# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Case Study*

- By 3 years following the initial accident, the patient suffered a lumbar disc herniation and was found to have two level severe spinal stenosis culminating in a two- level laminectomy and PLIF.
- The patient subsequently developed mechanical allodynia, swelling, and hyperalgesia of both lower extremities. His back pain remains severe without evidence of surgical complication.
- Oral opioid escalation has failed to MED 90
- What is the next step?



Not original patient x-ray



# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Case Study*

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- Intrathecal Trial of Morphine vs. Ziconotide
- Catheter tip placement
- Monotherapy vs. Combination therapy
- Case outcome: Intrathecal drug delivery and spinal cord stimulation has significantly improved generalized symptoms of CRPS and CLBP following PLIF. The patient remains wheelchair reliant, but patient lives independently



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## **Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery- Questions**

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery- Questions

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1. There is ample level 1 evidence to support the use of combined neuromodulation therapies (spinal cord stimulation, intrathecal drug delivery) for the treatment of chronic, intractable pain.

- A. True
- B. False

2. Which of the following statements is most true?

- A. Intrathecal drug delivery is best positioned as a therapy of last resort
- B. Spinal cord stimulation is superior to intrathecal drug delivery for the treatment of axial pain
- C. Spinal cord stimulation and intrathecal drug delivery have been shown to be effective in patients with a preponderance of chronic, nociceptive pain
- D. Intrathecal drug delivery is only reserved for patients that should transition from the use of oral pain medication.

3. A 71-year-old male patient with a history of ankylosing spondylitis presents with an 8-month history of sciatica following a fall. The patient has tried both gabapentin and pregabalin with no success. Recent MRI of the lumbar spine shows multiple levels of lumbar spinal stenosis to include severe nerve root compression at L5-S1 unchanged from previous MRI in 2018. The patient receives regular infliximab infusions under the supervision of his rheumatologist. A recent interlaminar epidural steroid injection demonstrated significant benefit in leg pain for 3 weeks. Consultation to neurosurgery results in a non-operative recommendation. The patient presents to the pain center for recommendations. Which of the following statements is false?

- A. Spinal cord stimulation and intrathecal drug delivery may be effective in the treatment of the patient's sciatica
- B. Close coordination with the patient's rheumatologist is essential due to the patient's increased risk of surgical infection.
- C. Co-existing pain generators may present as sciatica and must be evaluated before moving forward with neuromodulation.
- D. Both targeted drug delivery with ziconotide or paresthesia-independent spinal cord stimulation have very similar risk and safety considerations in this patient.

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# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery- Potential for Future Directions

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- Nanomedicine (6) and the restoration of partial function in spinal cord injury patients (7)
- Intrathecal chemotherapy and spinal cord stimulation for cancer pain states
- Intrathecal gene therapy and spinal cord stimulation for demyelinating peripheral neuropathy (8)

# Combination of Spinal Cord Stimulation and Intrathecal Drug Delivery: *Conclusions*

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- While used often in clinical practice, high level evidence is lacking in the literature
- The role of IDD as salvage therapy is challenged, but not obviated, by the advent of novel stimulation paradigms.
- Comprehensive understanding of the primary disease state indicates one therapy, but the use of dual therapy may be indicated as other coexisting disease processes progress.
- Simultaneous electrical and chemical neuromodulation should be explored in the future for the treatment of cancer and currently incurable neurological disorders

# Thank You!

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# References

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