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# Dorsal Root Ganglion Stimulation for Chronic Postoperative Abdominal Pain: A Case Report

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**Background:** Chronic postoperative abdominal pain (CPAP) is a common condition that significantly affects patients' lives with increased gastrointestinal symptoms and decreased quality of life (QoL). Management of CPAP continues to be challenging, and adequate analgesia remains difficult to achieve.

**Case Report:** A 77-year-old woman with a history of multiple abdominal surgeries presented with chronic right-sided abdominal wall pain with possible causalgia. After failing multiple interventions, dorsal root ganglion stimulation (DRG-S) at the T8-T9 level provided significant relief.

**Conclusions:** We present a case of a female patient with a history of multiple abdominal surgeries and CPAP, who experienced successful pain relief through DRG-S. Emerging research suggests that neuromodulations consisting of spinal cord stimulator (SCS) or DRG-S may be effective in managing visceral abdominal and pelvic pain caused by repeated distension and hyperalgesia, though more robust research studies are needed.

**Key words:** Chronic pain, neuromodulation, abdominal pain, causalgia

## BACKGROUND

Chronic postoperative abdominal pain (CPAP) lasting at least 3 months causes significant gastrointestinal discomfort and risks decreased mood, sleep, and overall quality of life (QoL) (1-3). Around 11% of individuals who undergo abdominal surgeries, such as cholecystectomy, herniorrhaphy, adhesiolysis, thoracotomy, and surgical stomas, experience CPAP (1,4-6). Adhesions from these operations are the cause of CPAP in approximately 60% of the cases (7). Current treatment options such as pharmaceutical management, nerve blocks, and radiofrequency procedures often fail to provide a lasting analgesic effect (8).

Neuromodulation, operating on the gate control theory of pain through the delivery of electrical impulses, may be considered when conservative measures fail (9). Spinal cord stimulators (spinal cord stimulation [SCS]) and dorsal root ganglion stimulation (DRG-S) have shown growing interest and evidence in managing chronic gastrointestinal pain (9-14), yet the research of utilizing these devices for the management of CPAP remains limited.

SCS has been shown to provide a degree of analgesia in chronic abdominal pain (14), and DRG-S is under investigation, as well (5,13). Targeting afferent signaling closer to the cell bodies of the dorsal root ganglion (DRG) may provide greater neuromodulatory benefits, though its effects on CPAP are not yet well understood (5,15). This case report describes a case report highlighting the successful use of DRG-S for the management of CPAP in a patient who had been suffering for over 15 years.

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## CASE REPORT

A 77-year-old woman with history of hypertension, chronic kidney disease, chronic obstructive pulmonary disease, lower extremity deep vein thrombosis on apixaban, and an extensive abdominal surgical history—including cholecystectomy, total colectomy, end ileostomy for colonic inertia, small bowel resection after perforation, chronic right-sided abdominal pain, and prior paraesophageal hernia repair—presented to the pain management clinic with 15 years of CPAP. Prior to presentation to the interventional pain clinic, the patient was hospitalized for acute worsening of chronic abdominal pain. At that time, CT of the abdomen and pelvis, esophagogastroduodenoscopy, gastric biopsy, and ileoscopy revealed hepatomegaly without other significant abnormalities to explain the etiology of pain.

On initial evaluation with pain management, the patient endorsed an average of 10 out of 10 sharp right upper quadrant pain without identifiable exacerbating factors. Given the degree of ongoing symptoms postoperatively, in the absence of other structural reasons for pain, the diagnosis of causalgia was suspected. A right-sided erector spinae block for a regional field block to address right-sided abdominal wall pain was completed. This led to 7 days of 100% pain relief immediately following the block with gradual return to an 8 out of 10 on the day 8 when her follow up occurred.

As the effect of the block lessened, the patients symptoms evolved to include "intense fullness" that prevented oral intake. Overall, her baseline was slightly improved from her preprocedure level but not sustained. Given her response to the block, the team recommended neuromodulation techniques to optimize long-term pain control with sustained relief.

Three months following the right erector spinae plane block, the patient underwent a right T8 and T9 DRG trial. T8 and T9 levels were selected prior to the procedure based on dermatomal pain levels and confirmed with intraoperative testing. Apixaban was held 4 days before the procedure. Given the patient's history of lower extremity deep vein thrombosis and the need to interrupt anticoagulation for the procedure, an IVC filter was placed by interventional radiology. The leads were placed into the right T8 and T9 foramen using an interlaminar approach as seen in Fig. 1.

One week following lead placement, the patient reported a greater than 60% improvement in pain and function. She was able to walk and stand with minimal discomfort, reported improved sleep, and experienced a reduction in her intake of oral pain medication. The trial leads were pulled without complication, and the patient was scheduled for permanent DRG-S placement.

One month later, percutaneous DRG lead implantation at the right T8 and right T9 with an Abbott implantable pulse generator was performed under general anesthesia. The leads were placed into the right T8 and T9 foramen using an interlaminar approach. The lead was advanced to its final position with the third contact positioned just underneath the pedicle as seen in Fig. 2. Tunneling was then performed from the lead incision site to the pocket site located beneath the left 12th rib in the left flank. The leads were inserted into the tunneling catheter and advanced to the pocket site, followed by lead placement into the implantable pulse generator (IPG) as shown in Fig. 3 and Fig. 4. Testing was subsequently performed to ensure adequate placement of leads into the IPG, and with electronic stimulator analysis, the impedance value was found to be within normal limits.

The permanent DRG leads were secured, programming was completed and the stimulator was set to the lowest level. The patient was discharged home in hemodynamically and neurologically stable condition. One week postoperatively, she presented with minimal analgesic relief with an average pain level of 7/10, attributing the lack of relief to the low setting of the stimulator. The stimulator was reprogrammed, and the patient reported almost immediate improvement in her abdominal pain. One month after permanent DRG-S placement, the patient reported complete analgesic relief of all lateral abdominal pain and improvement in overall functional status, including ambulation, activities of daily living (ADLs), and ability to tolerate oral intake without exacerbation of pain.

## DISCUSSION

Historically, SCS was the mainstay of neuromodulation therapy for the treatment of chronic pain. The primary indications for SCS are chronic intractable trunk or extremity pain associated with the following: refractory peripheral vascular disease pain, vascular angina. failed back surgery syndrome, complex regional pain syndrome (CRPS), radiculopathic pain with or without degenerative disk disease, neuropathic pain, spinal stenosis, perineal pain, and urologic disease (16,17). However, due to the posture-related motion of the spinal cord in the thecal sac, anatomical complexity, and shunting of the electrical current from the cerebrospinal


Fig. 1. Four-contact Abbott percutaneous leads placed for right T8 and T9 DRG stimulator trial.

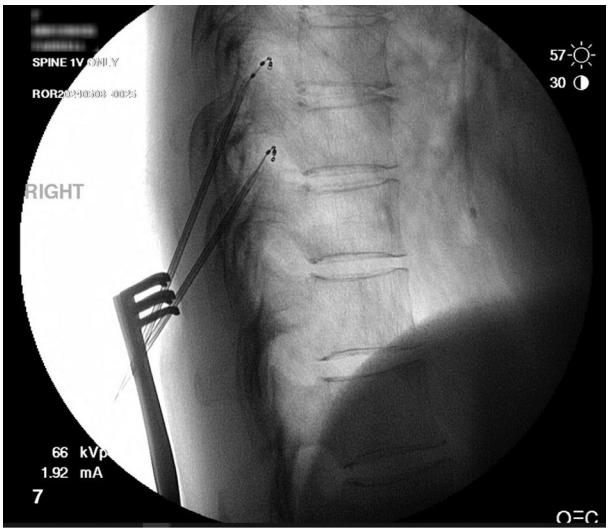


Fig. 2. Percutaneous DRG lead placement at right T8 and T9 dorsal root ganglion.

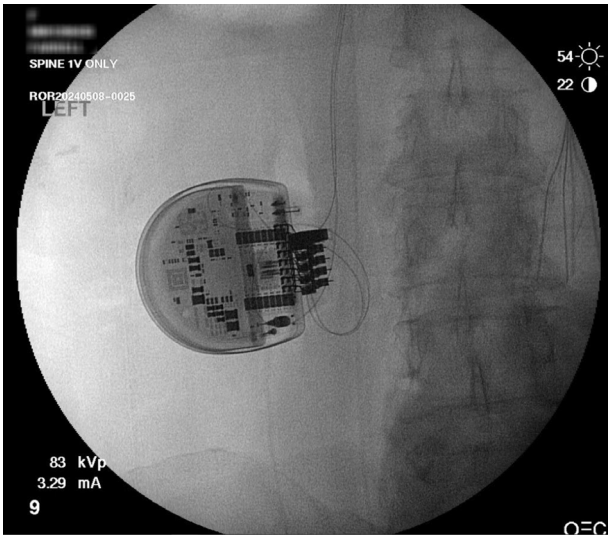


Fig. 3. Implant 1 - IPG implantation into pocket site located below left 12th rib in the left flank.

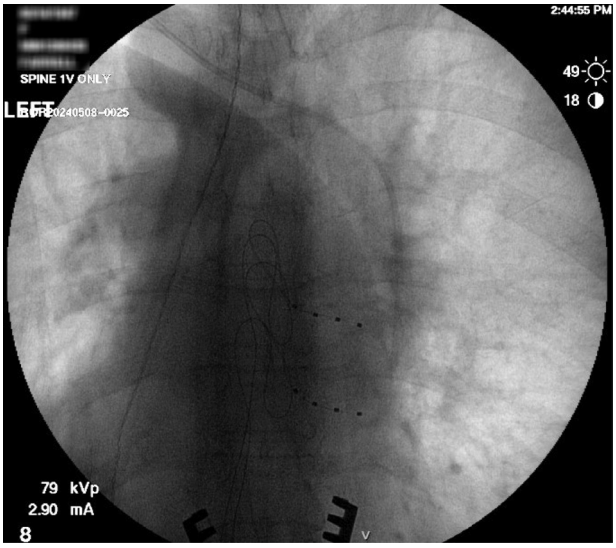


Fig. 4. Final image of right T8 and T9 Abbott percutaneous leads placement with strain relief loops.

fluid, certain regions are susceptible to pain refractory to SCS treatment (18). These challenges have resulted in advancements in treatment options through more targeted neuromodulation with the emergence of DRG-S.

DRG-S is hypothesized to treat refractory chronic pain in a dermatomal distribution by targeting the sensory afferents at the DRG (19). Located just outside of the dorsal spinal column, the DRG contains the cell bodies of the primary sensory neurons that provide dermatomal sensory innervation (20). Electrical impulses from DRG-S trigger action potentials in Aβ fibers that activate GABAergic inhibitory interneurons and block ectopic APs from reaching the spinal cord and the central nervous system (21). It has also been shown that DRG-S may amplify cathode stimulation and frequencies greater than 2 Hz resulting in afferent signal blocking (22).

Nociception in gastrointestinal pain involves spinal afferents receiving nociceptive input from the abdominal organs (23). In CPAP, organ dysfunction and/or peripheral sensitization at the site of injury can lead to inflammatory hyperexcitability of afferent nerve fibers, which synapse in the DRG before transmitting nociceptive signals to the CNS (24). With chronicity, peripheral sensitization may enhance the expression of nociceptive ion channels, accelerating central sensitization that contributes to hyperalgesia or allodynia (25).

The current Food and Drug Administration (FDA) indications for DRG-S is as an aid in the management of moderate to severe chronic intractable pain of the lower limbs in adult patients with CRPS types I and II (26). The use of DRG stimulation for chronic abdominal pain described in this case is off label. While the evidence for chronic abdominal pain is limited, the ACCURATE trial highlights the efficacy of DRG-S. This landmark prospective study demonstrated profound pain relief and improved quality of life with DRG-S when compared to dorsal column SCS (15,27). Furthermore, the benefits of utilizing DRG-S to specifically treat chronic abdominal pain have been noted by individual case reports (28-32). These studies have looked at DRG-S efficacy in treating CPAP following resection of a pancreatic mass, whipple procedure, and persistent abdominal pain following bypass surgery (31,32). Additionally, reports of DRG-S for the treatment of other abdominal conditions like inflammatory bowel disease have resulted in analgesia, as well (13,28,29). Though more robust randomized prospective trials would bolster these findings, these studies highlight the use of DRG-S as an intervention for chronic abdominal pain. Our study is unique in investigating the utilization of DRG-S for CPAP that has persisted for at least 15 years. Though previous prospective studies have demonstrated an improvement in QoL and analgesia in patients with chronic abdominal pain treated with SCS (14,33), patients with a dermatomal distribution of pain may have pain refractory to SCS. Given that this patient experienced successful pain relief with DRG-S, this intervention should be considered for CPAP that is refractory to traditional management

## CONCLUSIONS

This case reports the successful use of right T8 and T9 DRG-S to relieve 15 years of chronic right-sided abdominal pain, leading to improved ADLs, quality of life, sleep, and oral intake. While further studies are needed for DRG-S to become a standard treatment option for CPAP, this study provides evidence of its utility and success in providing analgesic relief when more conservative treatment options have failed. To our knowledge, there are limited case reports of DRG-S usage in long-term CPAP. Continued investigations are needed to measure the long-term effectiveness and durability of DRG-S in patients with CPAP.

### Author Contributions

- Sidharth Sahni conceived the case report idea, gathered clinical details, performed the chart review, and drafted the initial manuscript
- Harrison Jordan assisted with data interpretation, contributed to refinement of the clinical narrative and also helped draft the initial manuscript
- Anishinder Parkash provided guidance on diagnostic framing and reviewed the manuscript for clinical accuracy
- David Jevotovsky contributed to structural organization and revisions that improved methodological clarity
- Blanka Heary assisted with data acquisition and contributed to the description of the procedural course and follow-up
- Michael Farrell supervised the project, offered critical revisions, and approved the final version
- All authors reviewed the final manuscript and accepted responsibility for the content

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