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PRIOR HYPERMOBILE SPINAL CORD STIMULATOR REMOVAL WITH DIFFICULT REIMPLANTATION DUE TO EPIDURAL SCARRING PROVIDES RELIEF IN POSTLAMINECTOMY SYNDROME

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Background: When spinal cord stimulation (SCS) therapy fails for postlaminectomy syndrome (PLS), oftentimes the device is not removed or explanted, or rarely, it is reimplanted with the hopes of success with a new implant.

Case Report: Our patient is a 52-year-old man with a history of PLS treated with L5-S1 discectomy who presented with refractory chronic low back pain. He underwent an initial SCS implant with significant pain relief, but was limited due to unwanted abdominal stimulations with movement and explanted 8 months later. Despite his prior experience, a second SCS was implanted but with great difficulty due to widespread epidural scarring leading to a positional headache, which self-resolved. Fortunately, the second implant provided > 50% pain relief.

Conclusions: Our case highlights the importance of reconsidering an SCS reimplantation which may benefit a select group of individuals, though more research is required to define this subset of patients.

Key words: Hypermobile, unwanted stimulations, explant, reimplantation, spinal cord stimulator

BACKGROUND

Chronic pain is a pervasive and complex health issue that affects millions of people worldwide. In the United States alone, 50 to 100 million adults report experiencing chronic pain that significantly limits activities of daily living, making it one of the most prevalent health conditions in the country (1,2). The costs of chronic pain–considering degree of disability, loss of productivity, and health care expenditures–have been estimated to exceed $500 million per annum (in 2010 dollars) (2). Given the > 10% increase in patients with chronic pain from 2002 to 2018 according to one large survey (n = 441,707) (3), it is reasonable to expect this number to increase as the population ages and chronic pain becomes more common among older adults.

Pharmacotherapy, while effective for the treatment of acute pain, carries risks that may severely dampen ben-

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efits in many patients. Despite these potential benefits, prolonged use of pharmacologic agents often introduces a complex interplay of adverse effects, tolerance, and risk of dependency. In light of these challenges, alternative interventions to address pain control have gained prominence in recent years. One such approach, spinal cord stimulation (SCS), has emerged as a promising therapeutic option for individuals experiencing chronic pain.

SCS is a widely used neuromodulation technique for treating pain conditions, such as postlaminectomy syndrome (PLS), complex regional pain syndrome (CRPS), painful diabetic neuropathy, and nonsurgical chronic low back pain. SCS is proposed to relieve chronic pain through multiple mechanisms, including the activation of dorsal column Aβ fibers, attenuation of maladaptive signals triggered by local neuronal injury, and remodeling of local microcirculation (4-7). In randomized trials (6,8), SCS was shown to be an effective alternative to operative and pharmacologic management of chronic musculoskeletal pain syndromes. Furthermore, SCS was considered to be safe in these trials, though side effects observed include pain or discomfort at the implant site, lead migration or breakage, rare infection at the implantation side, and loss of therapeutic effect.

Additionally, some patients undergoing SCS implantation may experience paresthesias as well as the development of epidural scarring, which can pose challenges in the long-term management of chronic pain. Prescreening of patients who are most likely to benefit from SCS remains suboptimal and is an area of active investigation. Similarly, there are currently no guidelines to direct the reimplantation of stimulators in patients that have failed initial SCS therapy. There is also limited literature documenting cases where an original SCS device was removed and replaced with optimal lead placement following a successful trial. Here, we report a patient who underwent successful SCS reimplantation after experiencing complications and inadequate pain relief with the initial implant.

CASE PRESENTATION

The patient is a 52-year-old man with a past medical history notable for hypertension, gastroesophageal reflux disease, obesity, Raynaud's phenomenon, chronic migraine, and chronic low back pain in the setting of PLS following L5-S1 discectomy for lumbar radiculopathy. He was first evaluated by a pain management physician, in 2016, after a fall had exacerbated his preexisting bilateral low back and right-sided radiculopathy pain. Prior to the referral, he was trialed on multiple medications, including nonsteroidal anti-inflammatory drugs, neuropathic medications (gabapentin, topiramate, and duloxetine), acetaminophen, and ultimately opioids (Dilaudid and hydrocodone-acetaminophen). Subsequently, he underwent caudal epidural steroid injection and right-sided transforaminal epidural steroid injection, both of which provided only minimal relief.

Given the unremitting pain refractory to medication therapy and the aforementioned injections, the patient underwent an SCS trial with > 50% pain relief, and proceeded with a permanent implant in 2016 (Fig. 1). This SCS implant provided > 75% pain relief over the first year. However, after this time left-sided radiculopathy and unwanted bilateral abdominal paresthesias began to occur. SCS reprogramming was unsuccessful at ameliorating the unwanted abdominal paresthesia symptoms. Ultimately, the SCS was explanted, in 2022, given the lack of left-sided pain coverage and unwanted abdominal stimulation that was exacerbated when his arms were held in abduction. For the subsequent 8 months, the patient continued with multimodal analgesia as noted previously, as well as intermittent lumbar paraspinal trigger point injections that provided minimal relief. A repeat lumbar magnetic resonance imaging revealed multilevel disc desiccation and height loss most prominent at L5-S1, with moderate bilateral neuroforaminal stenosis and facet arthropathy noted at this level. Given the unsuccessful prior therapies, the patient was offered a paresthesia-free mode of SCS, to which the patient was agreeable.

The decision was made to move forward with another SCS trial. The second trial proved technically difficult given likely epidural scarring after the original SCS implant. The left paramedian approach at L1-L2 was uneventful with the right trial lead threaded to the middle of T9. The same process was attempted through the right paramedian approach, but significant difficulty occurred with threading the catheter into the epidural space and advancing it in the cephalad direction. However, after 2 attempts, the T12-L1 interspace was subsequently successfully accessed, and the second lead was threaded to T10. Twenty hours later, the patient reported a positional headache concerning for post-dural puncture headache. The headache was managed conservatively over the next 3 days and resolved on its own. Despite this complication, the patient reported 90% relief from this SCS trial.

Given excellent relief with the SCS trial, the decision was made, in 2023, to proceed with a permanent implant. Again, the procedure was technically challenging. For the permanent implant, the T12-L1 interspace was utilized for epidural access. The left-sided lead was threaded without issue, but the right side again proved more challenging with multiple attempts to redirect the lead for appropriate positioning. Nonetheless, both leads were placed at the top and middle of T9, respectively, with appropriate coverage achieved during intraoperative testing (Fig. 2). One month later, the patient reported > 50% relief of low back and bilateral leg pain and had improved mobility.

DISCUSSION

Chronic pain is a multifaceted issue associated with substantial morbidity, decreased quality of life, and economic burden due to lost productivity and early cessation from activities of daily living. SCS has been established as an effective treatment in a number of chronic pain syndromes, particularly in cases where conventional surgical and medical management provide inadequate pain relief or pose a substantial risk of adverse events. This case report highlights the importance of considering SCS reimplantation as a viable option when patients experience complications or inadequate pain relief with their initial implant, especially with older paresthesia methods.

The original decision to perform SCS implantation in this patient was based on his refractory pain following a discectomy and failure of conservative medical management. As outlined in the case, several complications and challenges arose, with unwanted abdominal stimulations with arm abduction and unsuccessful reprogramming attempts leading to explantation in 2022. The subsequent care plan involved further minimally invasive interventions with minimal effect. Ultimately, the decision to pursue a repeat SCS trial and permanent reimplantation was driven by the refractory nature of his pain and the new paresthesia-free modes, but difficulty was encountered due to epidural scarring due to prior SCS placement.

Review of the existing literature (9-12) reveals similar cases of complications following SCS implantation for the management of chronic low back pain and conditions, such as CRPS. Common complications include suboptimal lead placement, discomfort from stimulation in undesirable areas, and infection. In a retrospective review (13) consisting of 707 patients who had initial SCS trial lead placement, 527 patients eventually underwent permanent implantation. About 22.6% of patients with implants experienced issues with lead migration, while 9.5% and 6% experienced lead connection failure or

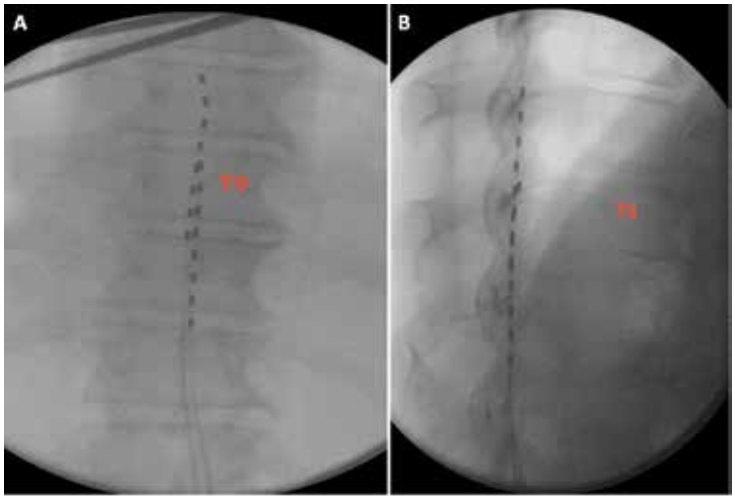

Fig. 1. Anteroposterior (A) and lateral (B) radiograph view demonstrating lead placement at the top of T8 and T9 during the initial SCS placement in 2016.

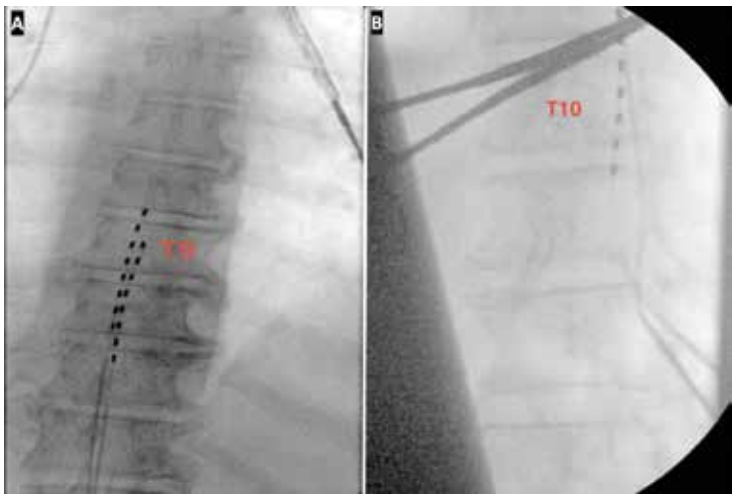

Fig. 2. Anteroposterior (A) and lateral (B) radiograph view lead placement at the bottom of T8 and middle of T9 during the second SCS placement in 2023.

lead fracture, respectively, and 4.5% of patients with the SCS implant had documented infections (13). Others had reported a 30% to 40% incidence of one or more complications (14). Few studies have reported instances of SCS explantation and subsequent replacement with optimal lead placement after a successful retrial. One case (15) was of a 36-year-old woman who successfully underwent a reimplantation procedure after an SCS lead breakage occurred after her third vaginal birth.

CONCLUSIONS

Despite the growth of SCS as a modality for pain management, there remains a need for standardized guidelines for managing complex cases. There is limited consensus on the optimal management strategy when patients experience suboptimal outcomes with SCS therapy or when a device should be reimplanted following explantation due to complications. There is still an insufficient number of reports detailing the management of failed SCS implants and subsequent retrial followed by reimplantation. As such, there is a clear need for a larger body of research for proceduralists to understand the nature of complications that arise post-SCS implantation. By documenting these challenges and paths taken toward successful resolution, cases such as ours–in aggregate–may help direct clinical practice and shape testable hypotheses compatible with randomized trials. Here, we provide valuable insights into the importance of comprehensive patient assessment, trial periods, optimal lead placement, and prompt consideration for reimplantation in patients who are good candidates for further procedural intervention.

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