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Epidural Abscess Following a Spinal Cord Stimulator Trial: A Case Report

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Background: Spinal cord stimulators (SCS) are used in the management of numerous chronic pain conditions. Prior to implantation, SCS trials determine whether patients are candidates and would benefit from neuromodulation therapy. Complications associated with these trials have been previously loosely discussed in conjunction with permanent implantation outcomes.

Case Report: In this case report, we present a patient who developed an epidural abscess requiring emergent surgical intervention and inpatient management following a SCS trial.

Conclusions: Complications associated with SCS implantation have been well-described, but literature delving into significant complications following short-term trials are uncommon and less specified. SCS trials can result in complications including epidural abscess and should be managed promptly and appropriately to prevent major patient comorbidities.

Key words: Spinal cord stimulator, neuromodulation, complication, surgical site infection

BACKGROUND

Spinal cord stimulators (SCS) are devices used to relieve chronic pain states by generating low-level electric fields between metal contacts within the epidural space. Some indications for SCS are postlaminectomy syndrome, complex regional pain syndrome, lumbago, peripheral vascular disease, intractable angina, and painful neuropathy (1). While the exact mechanism of action is still unknown, hypotheses include gate theory, changes in neurotransmitter factors, supraspinal mechanisms, and redistribution of blood flow (2).

With emerging technologies within neuromodulation, including burst and high-frequency stimulation, as well as their corresponding growing list of indications, patients and providers are more frequently turning to SCS as an option to manage chronic pain (2). However, complications in SCS are not insignificant. Incidences of complications are reported to be around 30% to 40% (3). This includes hardware-related, program/therapy-related, and biological complications. Examples of biological complications include hematoma or seroma formation, dural puncture headaches, nerve damage, device-related pain, and skin erosions. The most common biological complication, surgical site infection (SSI), has a reported incidence of 4% to 10% (3). Patients who have undergone permanent SCS implantation have been the focus of larger studies regarding SSI complications, especially in rare but significant circumstances that include epidural abscesses. In this case study, we describe the third reported epidural abscess following a SCS trial. The patient provided written informed consent (Health Insurance Portability and Accountability Act authorization).

CASE

A 67-year-old man with a history of coronary artery

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disease complicated by remote history of myocardial infarction status post multiple stents, hypertension, mood disorder, and bilateral knee replacements presented to the clinic with right leg pain. He is a former smoker with no significant family history.

The patient had a prior history of an occupational injury complicated by compartment syndrome and vascular compromise of his right lower extremity. At the time of injury, he underwent emergent fasciotomy, revision of his right knee replacement, and a right femoral-popliteal bypass with a left saphenous vein graft. On follow-up in the outpatient setting, the patient reported pain distal to his right knee, which was managed with physical therapy, braces, and medications, including oral pregabalin and gabapentin.

When he was seen in our clinic 4 years after the initial injury, the patient described burning, tingling, and shooting pain in his right leg with decreased range of motion. The pain worsened when standing still. His physical exam was notable for edema, erythema, and skin/hair changes in the right lower extremity with decreased sensation to light touch distal to the knee. Given the patient's history and exam findings, he was diagnosed with complex regional pain syndrome, type 2. He was initially managed with oral duloxetine, cognitive behavioral therapy, and multiple lumbar sympathetic blocks, which provided significant but short-lasting relief. After discussion with the patient and evaluation by a psychologist, the patient was deemed a candidate for a SCS trial.

Patient was positioned prone, and his skin prepped in sterile fashion with 2% chlorhexidine gluconate and 70% isopropyl alcohol followed by placement of a total body surgical drape. All proceduralists wore surgical hats and masks. A sterile scrub was performed using 4% chlorhexidine gluconate before donning sterile gown and gloves. Intravenous 2 g of cefazolin was administered over 10 minutes within 30 minutes of starting the procedure. The SCS trial was performed safely without complications or notable break in the sterile field (Fig. 1). No postoperative antibiotics were prescribed for the trial.

The patient was subsequently evaluated on postoperative day 7, the earliest available date convenient to

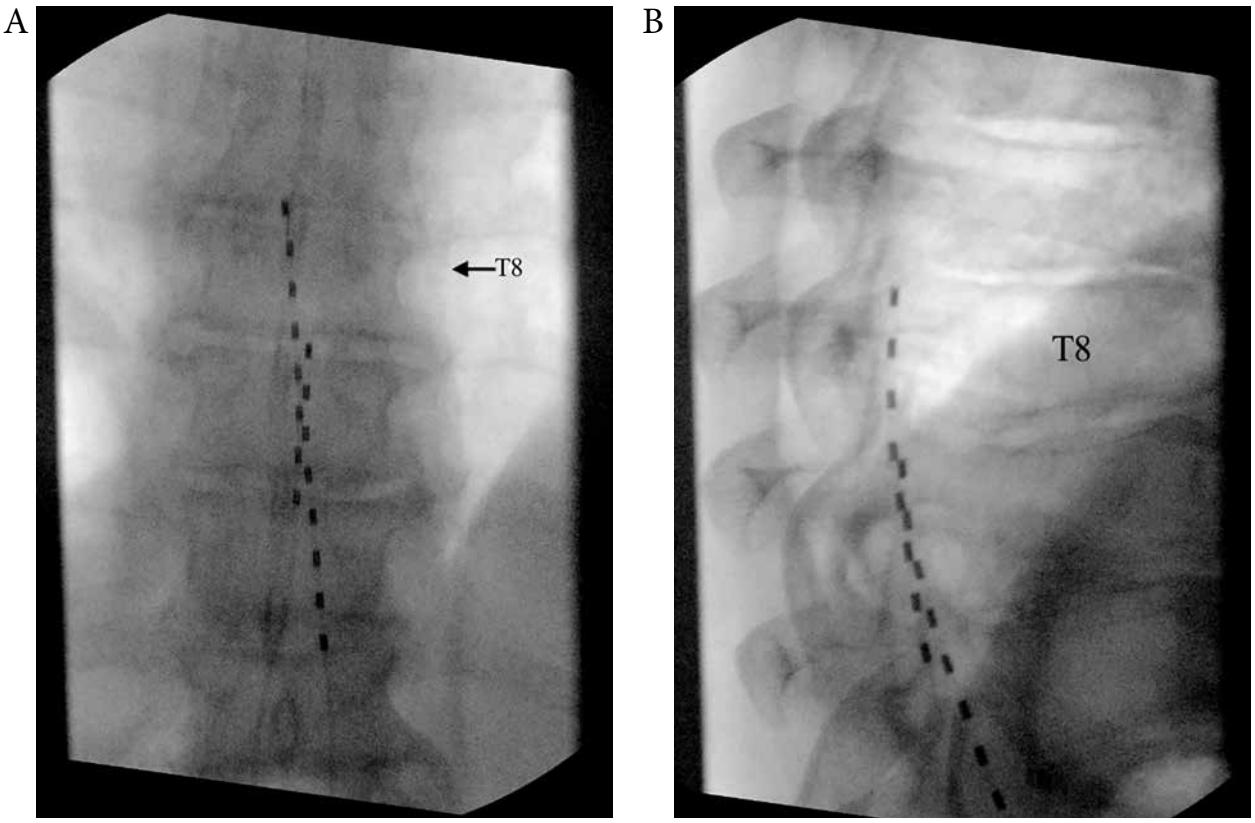

Fig. 1. Spinal cord stimulator (SCS) leads positioned at the inferior endplate of the T7 vertebral body and the superior endplate of the T9 vertebral body in anterior-posterior (A) and lateral (B) views.

the patient's schedule. He described 70% relief with the SCS. The trial leads were removed without complication, and he was scheduled for a permanent implantation. Two days later, the patient began to experience new left leg and back pain with clear drainage around the prior lead sites. Eleven days after the SCS trial, the patient called our clinic stating that he was in severe pain. He was instructed to go to the nearest emergency department. At that time, he denied any fevers, chills, nausea/vomiting, new weakness, or bowel/bladder changes. The patient was noted to have tenderness along his midline lumbar spine with erythema and purulent discharge from the wound. No new focal weakness or numbness was noted on physical exam. Lab work was significant for a white blood count of 11,900/uL, C-reactive protein level of 96.8 mg/L, and an erythrocyte sedimentation rate of 87 mm/h. Lumbar spine magnetic resonance imaging revealed an epidural collection at T12-L1 resulting in severe canal stenosis with no definitive cord signal change or enhancement (Fig. 2).

Neurosurgery was consulted and performed an emergent epidural abscess washout and T12-L1 laminectomy. In addition, the patient was started on intravenous cefepime and vancomycin. When abscess cultures returned positive for methicillin-susceptible Staphylococcus aureus (MSSA), treatment was narrowed to intravenous cefazolin. On discharge from the hospital, the patient was continued on parenteral antibiotics via a peripherally inserted central catheter line for 6 weeks.

DISCUSSION

Existing literature concerning SSI following SCS is primarily collected from studies following permanent implantation. Reported risk factors include history of peripheral vascular disease, recent infection within the 12 months prior to the procedure, sleep apnea, smoking, SCS trial lengths greater than 5 days, procedures performed in academic settings, and prolonged operative times (4,5). Interestingly, a recent multicenter, retrospective study found that host characteristics often considered risks for infections in other surgical procedures did not correlate with a higher infection rate in SCS, including obesity, malignancy, ongoing chemotherapy or radiation, and diabetes mellitus (5). Preventative factors include the utilization of sterile occlusive dressing and staged trials followed by immediate implant as opposed to implants after a trial phase (5).

On literature review, we identified 2 prior reports that describe cases of epidural abscess following a SCS trial (6,7). Both patients presented soon after placement of trial leads on postoperative days 2 and 4 with fever and back pain. Our patient developed symptoms after the leads were removed on postoperative day 9 with new onset back and left leg pain. No systemic symptoms or focal neurological signs were identified on

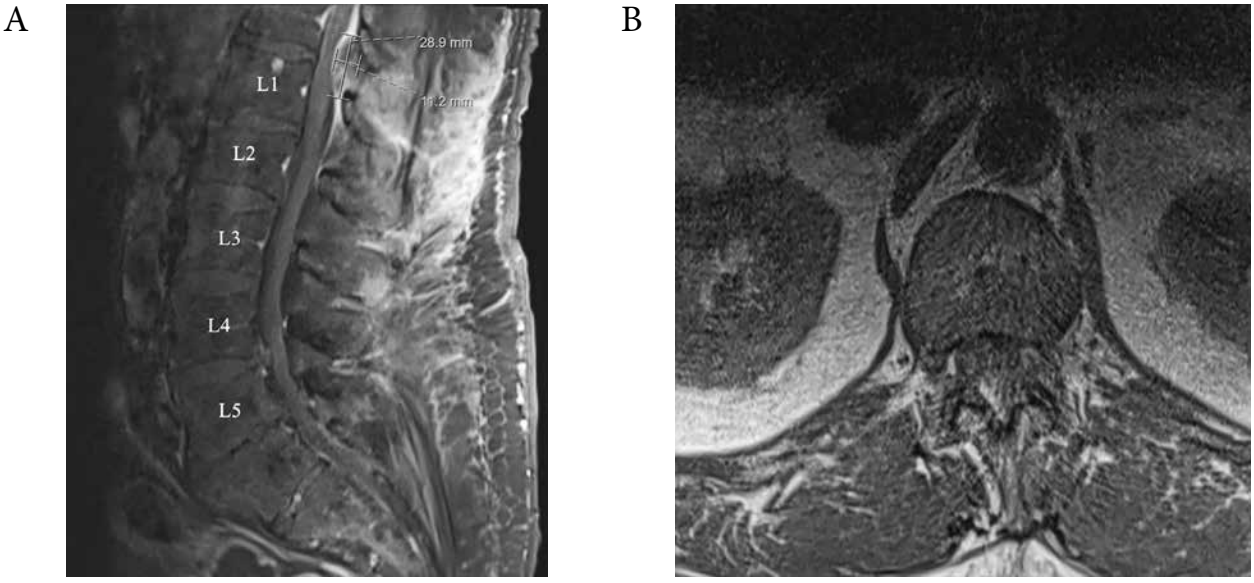

Fig. 2. Lumbar magnetic resonance imaging reveals epidural abscess collection at T12-L1 as seen in sagittal (A) and axial (B) views.

exam. Though both of these prior reports describe strict aseptic technique, specific details that may illuminate potential sources of infection or steps for improvement are absent.

In 2017, the Neurostimulation Appropriateness Consensus Committee (NACC) published recommendations for infection prevention and management in patients undergoing neurostimulation (8). This guideline outlines specific preoperative, intraoperative, and postoperative recommendations. Some notable consensus points include preoperative testing and subsequent decolonization of MSSA and methicillin-resistant Staphylococcus aureus (MRSA), preoperative antibiotic dosing, and discontinuation of antibiotics within 24 hours after SCS implant. Although our patient presented with increased risk for postsurgical infection due to a history of smoking, likely peripheral vascular disease, and a trial period longer than 5 days, we opted to not prescribe postoperative antibiotics as per NACC recommendations. This decision was made after discussion between the patient and provider weighing risk vs benefits based on the most current literature. Of note, although guidelines recommend against prophylaxis antibiotics more than 24 hours post implant, Hoelzer et al (5) did find a significant decrease in risk for infection among patients who received postoperative antibiotics. In addition, a MSSA/MRSA screen and decolonization were not performed, which may have provided significant benefit as final cultures from the abscess resulted in MSSA speciation (9).

An international survey of physicians who perform SCS trials and implantations revealed that only 4 of 15 guidelines or questions had compliance rates greater than or equal to 80% (10). This suggests further education may be warranted on infection control strategies among interventional pain and neurosurgery physicians as outlined by the Centers for Disease Control and Prevention, National Institute for Health and Care Excellence, and Surgical Care Improvement Project.

CONCLUSION

We present the case of a patient who required parenteral antibiotics and surgical intervention in the management of a complication after trial. While infections associated with SCS implantation have been studied, there is significantly less information regarding SCS trials, even though the placement of a foreign body in the epidural space for any period of time can be a nidus for infection. Epidural abscess can result in significant permanent neurological damage if not managed appropriately.

Author Contributions

Gabriel Nam performed the literature search, drafted, and edited the body of the text. Douglas Gugger performed the chart review and guided in writing direction.

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