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ANTICOAGULATION MANAGEMENT DURING A SPINAL CORD STIMULATOR TRIAL ON A PATIENT WITH ST-ELEVATION MYOCARDIAL INFARCTION

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Background: Spinal cord stimulators (SCSs) are indicated for the treatment of many pain syndromes. They are often trialed prior to placement of a permanent implant. Patients on anticoagulation therapy are instructed to follow the American Society of Regional Anesthesia and Pain Medicine guidelines during this process.

Case Report: Here we describe a unique case of a patient who had an SCS trial, followed by an ST-elevation myocardial infarction (STEMI) on day 4 postimplantation. After coronary revascularization, the patient started dual antiplatelet therapy, which posed significant for epidural hematoma with recent stimulator implantation.

Conclusions: The patient was bridged with intravenous antiplatelet agents prior to SCS trial removal and monitored closely. Our discussion will focus on all anticoagulation management of patients with a recent STEMI who had undergone a trial SCS implantation.

Key words: Spinal cord stimulation, neuromodulation, chronic pain, anticoagulation

BACKGROUND

Failed back surgery syndrome and postlaminectomy syndrome are defined as lumbar spinal pain that persists despite surgical intervention (1). While the pathophysiology of these syndromes is not fully understood, the proposed mechanisms involve epidural fibrosis and scar tissue that leads to vascular compromise, increased tension, and impaired axoplasmic transport (2). The incidence of these pain syndromes ranges from 10% to 40% in the spine surgery population (3).

Spinal cord stimulation (SCS) is the most used implantable neuromodulation modality for the management of postlaminectomy pain and failed back surgery syndrome. It has proven to be > 80% effective in the short term (4). Per the American Society of Regional Anesthesia and Pain Medicine (ASRA) guidelines (5), SCS is considered a "high-risk procedure" as it pertains to bleeding risk. As a result, strict anticoagulation guidelines should be followed to reduce the risk of epidural bleeding and consequent neurological injury (5).

We present a case of an SCS trial, where the patient was diagnosed with an ST-elevation myocardial infarction (STEMI) on day 4 out of 7 of his SCS trial. We believe it is vital that close communication and a multidisciplinary approach between the patient, the pain management team, and the cardiology team should occur to best navigate a situation with 2 competing factors: The need for emergent and aggressive anticoagulation vs the risk of epidural bleeding. Here we discuss the approach and reasoning on how to best manage anticoagulation during this event.

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METHODS

Patient Presentation

The patient is a 70-year-old man with a history of type 2 diabetes, hypertension, and gastroesophageal reflux disease, who had previously undergone 3 lumbar surgeries, L1-L5 decompression laminectomies, and T11-S1 fusion, from 2016-2019, because of lumbar spondylosis with radiculopathy and lumbar stenosis with neurogenic claudication (Figs. 1 and 2). Despite previous surgical intervention, the patient continued to have low back pain and left lower extremity pain. The patient had undergone various modalities, including medication management with gabapentin, duloxetine, and oxycodone. Additionally, the patient underwent a caudal epidural steroid injection and bilateral SI joint injection in 2019 and 2020, respectively. Both pharmacologic and interventional modalities failed to alleviate the patient's pain.

The patient presented to our clinic (Norman Prince Spine Institute at Rhode Island Hospital, Providence, RI) in 2021 with continued low back pain and left leg pain, which he rated at 9 out of 10 on a Numeric Rating Scale. On exam, there was mild sensory loss to pinprick and fine touch in a left L5 distribution. The patient was treated with an increased dose of gabapentin and a repeat caudal epidural steroid injection, with a limited response to both. The decision was made to pursue an SCS trial.

In September 2022, the patient presented for an SCS trial. At this time, the patient's medications included amlodipine 10 mg daily, atenolol 100 mg daily, atorvastatin 40 mg daily, metformin 1,000 mg daily, tamsulosin 0.4 mg capsule, and gabapentin 600 mg 3 times daily. The epidural space was accessed at T11-12 with 14G Touhey needles. Bilateral SCS contact leads were placed at the cephalad aspect of the T8 vertebral body (Fig. 3). The trial itself was uneventful. The patient reported approximately 85% relief in his pain.

On day 4 of his SCS trial, the patient presented to the emergency room with chest pain. He was diagnosed with an acute STEMI. He was taken to the catheterization laboratory (Cath Lab) for revascularization and received a drug-eluting stent (DES) to the mid-left anterior descending artery. The patient received full anticoagulation, including 600 mg of Plavix loading, aspirin (ASA) 325 mg, and heparin drip. After DES was placed, the patient was transferred to the coronary care unit and was started on Plavix 75 mg daily and ASA 81 mg. Unfortunately, the pain management team was not contacted and due to the emergent nature of the procedure, the SCS leads were left in place.

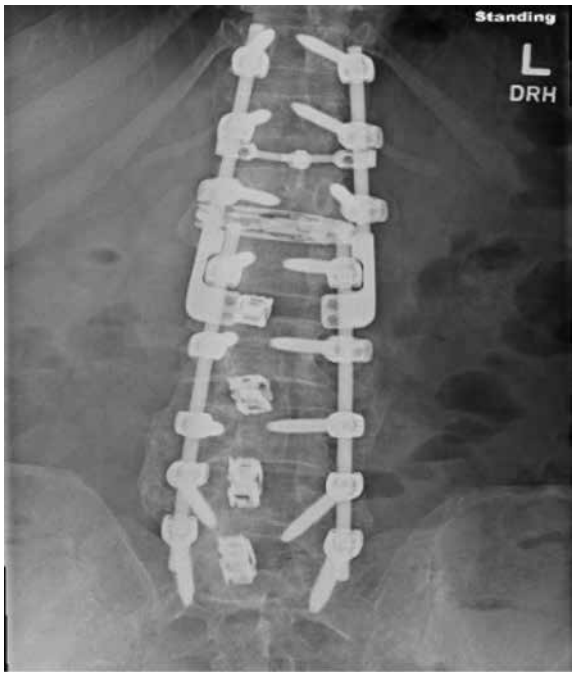

Fig. 1. Baseline x-ray of thoracolumbar spine. Note laminectomy decompression at L1-L5 and fusion at T11-S1.

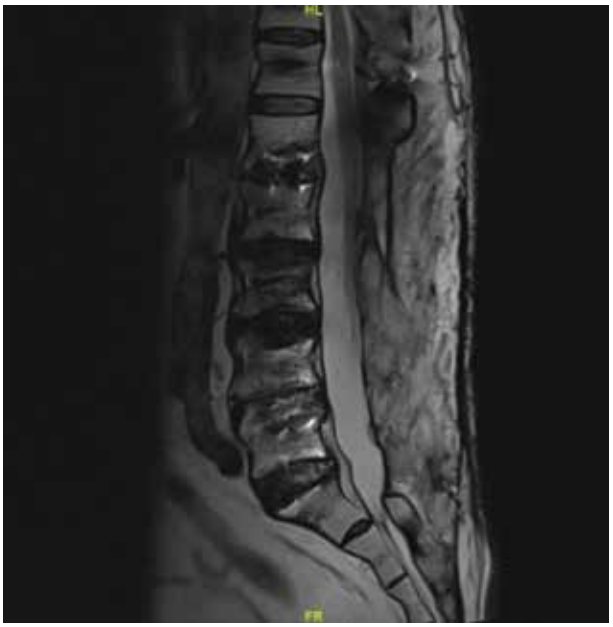

Fig. 2. Baseline MRI of lumbar spine. Note laminectomy defects L1-L5 and widely patent spinal canal. No further surgery deemed necessary by neurosurgery team. MRI, magnetic resonance imaging.

Ultimately, after weighing the risks and benefits, it was decided that the patient would continue ASA 81 mg, stop Plavix for 5 days, and received intravenous (IV) cangrelor bridging for 24 hours prior to removal of the trial leads. The leads were successfully removed, and the patient was restarted on anticoagulation. Frequent neurochecks were performed every 2 hours for a total of 24 hours. The patient was discharged from the hospital with no change in his neuroexamination. At 6 months follow-up, the patient is doing well from a cardiac perspective, and we will consider SCS retrial in 12 months.

DISCUSSION

A STEMI is a serious event with high morbidity and mortality, which requires immediate anticoagulation and revascularization within 90 minutes (6). Priority should be given to stabilizing the patient in the Cath Lab. Relevant medications (Table 1) that are used as part of the revascularization process include ASA, clopidogrel, heparin drip, and ticagrelor. The benefit from ASA was found in an observational study of 65,175 patients who underwent percutaneous coronary intervention between 2010 and 2011, showing a 1.9X reduction in mortality (7,9,10). Additionally, there was significant mortality benefit and decreased in-stent thrombosis to giving a P2Y12 inhibitor plus ASA vs ASA alone vs anticoagulant therapy alone (heparin) (8). The least effective management is use of the heparin drip alone, as in-stent thrombosis is primarily a platelet-mediated event. Finally, the antiplatelet therapy for reduction of myocardial damage during angioplasty trial showed that a high-loading dose of P2Y12 inhibitor (600 mg clopidogrel) reduced mortality by 50%. For these reasons, a loading dose of clopidogrel 600 mg and ASA 325 mg are typically administered prior to revascularization. Anticoagulation with dual antiplatelet therapy (DAPT) should be uninterrupted for 6 months, but recent studies (9-11) have confirmed the safety of DAPT duration as short as one month in patients deemed to be at high-bleeding risk.

In the setting of a patient who is undergoing an SCS trial, this level of anticoagulation poses a risk of epidural bleeding if the leads are removed without care. While the incidence of epidural hematoma is low, about 1 in 150,000, this goes up significantly in patients who are anticoagulated (12). Hence, the ASRA has guidelines about stopping and restarting anticoagulants as per Table 1 to reduce the risk of epidural hematoma.

The predicament of a patient with a recent STEMI who had an SCS trial requires careful management of anticoagulation. The preservation of stent patency with the need to remove SCS trial leads without bleeding presents a fine balance.

In a multidisciplinary approach, the following scenarios were discussed with the pain medicine team, the patient, and the cardiology team:

1. Continue ASA 81 mg, stop Plavix for 7 days - removing leads and restarting Plavix 24 hours later.
2. Reversing Plavix and ASA by giving pooled platelets, checking P2Y12 assay, and pulling leads if assay reflected platelet recovery.
3. Leaving the SCS leads in the epidural space for an additional 30 days for the patient to receive uninterrupted DAPT.
4. Continue ASA 81 mg, stop Plavix for 5 days, starting bridge with IV cangrelor 24 hours prior to lead pull, and stopping cangrelor 3 hours prior to lead pull.

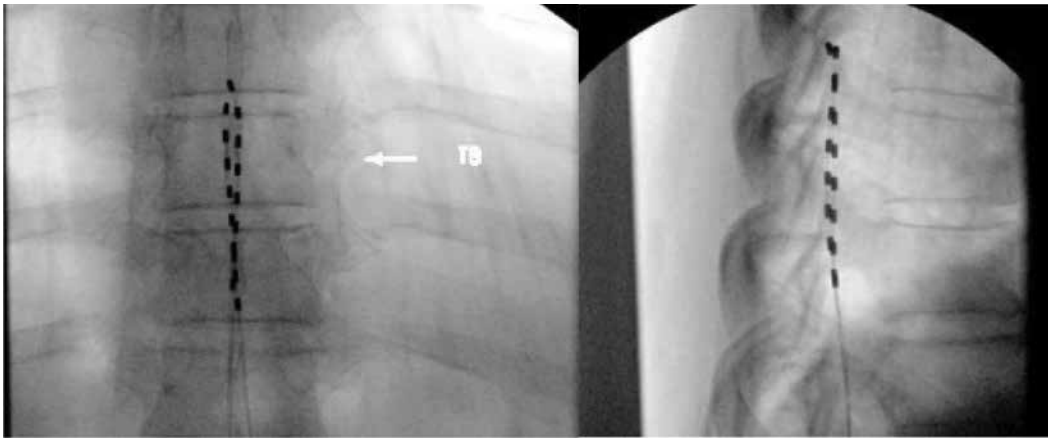

Fig. 3. SCS lead placement at top of T8 vertebral body. Pain coverage included lower back and bilateral legs. SCS, spinal cord stimulator.

Table 1. Relevant medications for pain management team in patient with STEMI. ASRA guidelines for starting and stopping medication as it pertains to SCS trial.

Medication	Mechanism of Action	Hold Before Procedure	Restart After Procedure
Clopidogrel (Plavix)	P2Y12 receptor antagonist	5-7 d	12 h for 75 mg, 24 h for loading dose
ASA 81-325 mg	Cox-1 inhibitor	4-6 d or risk assessment	24 h
Heparin Gtt	Antithrombin III activator -> inhibits factor X, Xa	6 h	Immediately
Ticagrelor (Brilinta)	P2Y12 receptor antagonist	5 d	24 h
Cangrelor (Kengreal)	P2Y12 receptor antagonist	3 h	24 h

Abbreviations: STEMI, ST-elevation myocardial infarction; ASRA, American Society of Regional Anesthesia and Pain Medicine; SCS, spinal cord stimulator; ASA, aspirin; Gtt, glucose tolerance test.

We felt options 1 and 2 posed the highest risk for in-stent thrombosis. Any significant interruption of the antiplatelet regimen within 30 days poses the greatest risk of rethrombosis. While option 3 would protect the stent, it would pose a high risk of epidural abscess since the leads would be retained for approximately 35 days. We felt option 4 was the best compromise of protecting the stent from thrombosing and protecting the patient from an epidural hematoma. We continued ASA 81 mg, as this is within ASRA guidelines for patients with a high risk of a thrombotic event. We stopped Plavix for 5 days, followed by bridging with IV antiplatelet agent cangrelor for 24 hours prior to lead pull. Bridging with IV heparin or Lovenox would not be adequate, since in-stent thrombosis is primarily a platelet-driven process. The tremendous benefit of IV cangrelor is its short half-life, giving one the ability to stop the medication for 3 hours and restart after 3 hours. While ASRA guidelines recommend waiting 24 hours to restart cangrelor, real-world data (13) shows it can be restarted safely in 3 hours without increased risk of bleeding.

CONCLUSIONS

This case illustrates 2 important competing factors in a patient who is undergoing SCS trial while having a STEMI: The need for anticoagulation to avoid in-stent thrombosis vs the need to stop anticoagulation to safely remove the epidural SCS leads without causing epidural hematoma and neurological injury. The American Heart Association guidelines call for strict 30-day DAPT therapy, and 6 months recommended, while ASRA guidelines call for strict stoppage of antiplatelet agents ranging from 5-7 days. IV cangrelor is a great option to balance these 2 competing factors. While we realize there may be multiple ways to navigate this case, we feel strongly about using a multidisciplinary approach that includes the pain medicine team, the cardiology team, and the patient.

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