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Successful Administrations of Neuraxial Anesthesia Intrapartum in a Pregnant Patient with an Implanted Thoraco-lumbar Spinal Cord Stimulator: A Case Report

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Abstract

Chronic pain affects approximately 100 million Americans with an incidence of 3 million cases per year and almost half of these cases include middle-aged females. In certain refractory cases chronic pain management may include the placement of a spinal cord stimulator. Considering half of chronic pain cases involve middle-age women, which also encompasses the reproductive years, obstetric anesthesiologists has encountered a new challenge: caring for the pregnant patient with an implanted spinal cord stimulator. This new encounter may become more commonplace as women are now delaying childbirth into their thirties and almost one fifth of these women are over the age of 35. There is limited data on the safe administration of neuraxial anesthesia to a pregnant patient with an implanted spinal cord stimulator, particularly a thoraco-lumbar stimulator. This case report documents a pregnant patient with an implanted thoraco-lumbar spinal cord stimulator who successfully received neuraxial analgesia intrapartum during two separate pregnancies. The patient is a 36-year-old female who suffers from refractory chronic back pain and received a thoraco-lumbar spinal cord stimulator after spinal fusion failed to relieve her pain. During her first pregnancy the stimulator was inactivated due to its unknown potential risks to the developing fetus. Intrapartum the obstetric anesthesiologist successfully administered neuraxial anesthesia under ultrasound guidance thus providing analgesia during labor and delivery. In 2017 she presented to labor and delivery as a gravida two with the inactive spinal cord stimulator and successfully received neuraxial anesthesia under ultrasound guidance a second time.

Keywords: Spinal cord stimulator; Pregnancy; Chronic pain syndrome

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Introduction

Chronic pain can be a long-term, debilitating condition which affects approximately 100 million Americans. Three million cases are diagnosed every year and the management of chronic pain is becoming an increasing burden on the healthcare system. Of the three million cases diagnosed yearly half of these include women [1]. For many reasons, including socioeconomics and advances in assisted reproductive technology, an increased number of women are choosing to delay childbearing until their late thirties. From 1990 to 2009 a European study found the percentage of births in mothers aged 35 years or older had increased from 13% to 19% [2]. This shift toward an older maternal age at conception has likely led to more pregnant women presenting with chronic pain syndrome.

Neuromodulation is a treatment option for patients affected by refractory chronic pain and is achieved via a spinal cord stimulator (SCS). SCSs may also be used as part of a multi-modal approach that involves conservative therapy (lifestyle and behavior modifications), minimally invasive techniques, and conventional pharmaceutical management [3]. Neuromodulation is based upon the gate-control theory that suggests interference is produced by non-painful stimulation, which leads to reduced perception of noxious stimulus in the brain [4]. This reduction in pain perception is of particular benefit to those who experience chronic back pain

and can help to reduce the amount of medications needed for adequate pain relief and improved quality of life [5,6].

Despite the increased number of pregnant women presenting with chronic pain, limited data on the potential effect(s) of a SCS and continued stimulation during pregnancy requires caution. Women should be advised of the potential risks, including fetal demise, if they are to become pregnant after SCS implantation [7]. Recent case reports show that continued stimulation had no effect on the fetus; however, until more data on its safety is gathered current guidelines urge vigilance by the obstetrician and discontinuation of stimulation for the duration of the pregnancy [8,9]. Due to this limited data pregnant women who suffer from chronic pain, especially those with a SCS, provide a distinct challenge to the obstetrician and anesthesiologist in providing pain management in both the prenatal and intrapartum period.

Case Report

Our patient is a 36-year-old woman who suffered from chronic pain with the following associated symptoms: numbness, tingling, weakness, headaches, and restricted range of motion of her spine and lower extremities. She underwent a spinal fusion of L5-S1 for a herniated disc which was unsuccessful in relieving her chronic back and lower extremity pain. In 2011 she underwent placement of a SCS to help control her refractory pain symptoms. The epidural space was accessed via T12-L1 and L1-L2 and the device's two leads were negotiated cephalad to the T8-T9 interspace. The implantable pulse generator (IPG, Medtronic Corp.) device was placed over the left iliac crest following connection to the leads [10].

The SCS was deactivated for the duration of the pregnancy. During the prenatal period the patient expressed her desire for an epidural during labor and thus the high-risk obstetric anesthesia service was consulted. The location of the SCS's leads, wires, and the IPG were reviewed using old radiographs and the operative report. After consultation with the patient and explanation of its potential benefits and risks, neuraxial anesthesia under ultrasound guidance was planned [11].

The patient presented to labor and delivery at 37 weeks gestational age for induction of labor secondary to oligohydramnios. The pregnancy was further complicated by a fetal arrhythmia, however this spontaneously resolved at 35 weeks of gestation. On the labor and delivery unit her physical exam was significant for asymmetry and straightening of her cervical spine and mild lumbar scoliosis. She had point tenderness along parts of her spinal column and her greater trochanter. Range of motion of spine and lower extremities was limited with a normal gross motor tone. She had symmetric reflexes bilaterally.

The obstetric anesthesiologist used ultrasound guidance to outline the wires of the nerve stimulator. Then under direct visualization an epidural catheter was placed with the patient in the sitting position using a 17-gauge Tuohy needle at the L3-L4 interspace without disruption of the wires. She had no pain during the first or second stage of labor and had an uncomplicated normal spontaneous vaginal delivery of a live infant. She was then followed while inpatient in the immediate postpartum period and reported adequate analgesia. She was discharged home on postpartum day two.

The same patient presented for prenatal care and anesthesia consultation in 2017. She did not reactivate her stimulator since her delivery in 2013 as her chronic pain was well controlled. Patient was admitted to labor and delivery at 38 weeks gestation with spontaneous rupture of membranes. She again requested and successfully received epidural anesthesia, which was placed under ultrasound guidance with adequate visualization of the SCS leads. She proceeded to have a normal spontaneous vaginal delivery of a live infant without complications and reported adequate pain control. Again, her postpartum course was uncomplicated and she was discharged home on post-partum day two.

Discussion

Limited information exists in the literature regarding safe and effective pain management intrapartum in pregnant patients with an implanted SCS device. One case series described seven women with a combination of cervical and thoracic spinal cord stimulators.12 All but two of the seven women delivered live infants via cesarean section, with one of these patients delivering preterm secondary to multiple gestation. Two of these women with cervical SCS had term uncomplicated vaginal deliveries following successful placement of epidural anesthesia. Yet the location of the SCS leads was in the cervical region due to chronic pain syndrome in the upper extremities. One patient had her device active during the prenatal course, while the other patient inactivated her SCS [12].

Questions remain regarding the efficacy of SCSs during pregnancy considering the significant physiologic and biochemical changes that occur during pregnancy [9,11]. For example, pain thresholds during pregnancy are altered by hormonal changes and patients may not require continued neuromodulation [13]. Thus, it is uncertain whether a SCS should be deactivated for the duration of the pregnancy. Our patient reported minimal to moderate discomfort while the SCS was deactivated. Further, adverse outcomes of a SCS to the developing fetus have not been well studied. More prospective studies are necessary to examine these maternal and fetal outcomes of pain management with a SCS during pregnancy.

Lumbar SCSs in pregnant women create a unique challenge for the obstetric anesthesiologist. The physical presence of the leads of the implantable device in the epidural space can make administration of neuraxial anesthesia challenging. The SCS leads may be incidentally cut with the epidural needle or can migrate from their original location secondary to neuraxial anesthesia [11]. Yet a review of the available literature by Bernadini et al. demonstrates that the risk for migration is decreased secondary to the formation of a sheath from fibrous deposits [11]. The placement of neuraxial anesthesia may also potentially introduce bacteria to a site that is already occupied by a foreign body, as the leads serve as a potential nidus for infection [14]. Lastly there have been case reports of inflammatory reactions to SCS leads, which can further complicate a pregnancy case [15].

Conclusion

We focus on the intrapartum management of pain in a pregnant patient with an existing thoraco-lumbar SCS and conclude that with good direct ultrasound visualization of the leads and wires of the device, one can successfully place an epidural catheter and provide effective pain control during labor and delivery. Furthermore, the successful use of neuraxial anesthesia in pregnant women with SCSs has been replicated in other studies during cesarean delivery yet the majority of cases reported include women with upper extremity pain and thus cervical SCSs. With a cervical SCS one can conclude that placement of an epidural catheter would not be a challenge as catheters for laboring patients are normally placed in the lumbar region, well out of the way of cervical leads. To the best of our knowledge, this is the first case reported in the literature of a pregnant patient with a thoraco-lumbar SCS receiving successful neuraxial anesthesia twice during two separate intrapartum courses.

In summary, the following are recommendations when caring for the pregnant patient with a SCS and for the successful placement of epidural anesthesia in labor:

- Turn off the SCS device as the potential maternal and fetal risks of the device are unknown during pregnancy.
- Plan for a pre-operative anesthesia consultation.
- Obtain prior imaging and operative report to determine the location of the leads, wires, and the pulse generator.
- Communicate with the physician who placed the device.
- Call the representative of the device manufacturer.
- Use ultrasound to visualize the leads during placement of the epidural catheter.
- Avoid the laminectomy/fusion area if present.
- Use proper technique to avoid infection during placement of neuraxial anesthesia.
- Create a pain plan for the post-partum period.

We demonstrate that women who suffer from chronic pain and have a preexisting SCS implanted in the lower thoracic or lumbar region can undergo successful and safe placement of epidural analgesia for labor pain with the use of direct ultrasound guidance by a skilled anesthesiologist.

Highlights

- Safe administration of neuraxial anesthesia in a pregnant patient with an implanted spinal cord stimulator
- Successful administration of neuraxial anesthesia intrapartum on two separate occasions in the same patient with a thoraco-lumbar spinal cord stimulator.
- Guidelines for administering neuraxial anesthesia in a patient with an implanted sacral spinal cord stimulator

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Conflict of Interests

The authors declare no conflicts of interest.

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