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Case Report

Use of Spinal Cord Stimulator for Treatment of Lumbar Radiculopathy in a Patient with Severe Kyphoscoliosis

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Spinal cord stimulation (SCS) has been a therapeutic option for chronic pain for over 40 years with a common indication being failed back surgery syndrome (FBSS). This case reports the successful implantation of a spinal cord stimulator in a patient with FBSS and kyphoscoliosis for treatment of radicular pain. Technical considerations and anatomical difficulties that may be encountered during placement with kyphoscoliosis will be discussed. This patient had failed other therapies including oral medications, epidural steroid injections, spinal surgeries, and physical and aquatic therapies. On physical examination the patient had a severely deformed lumbar spine. Careful review of the spine radiographs and CT scan revealed lead placement might be possible at the level of T12-L1 or L1-2.

A Medline search did not reveal a case of kyphoscoliosis with radicular pain treated with SCS. After a successful percutaneous trial, a SCS was implanted. Fourteen weeks later, the patient reported being pain free with an increased physical activity level and opioid discontinuation.

Technical considerations with kyphoscoliosis may discourage pain physicians from attempting SCS. This case illustrates that with careful selection, some of these patients may be candidates for SCS with good results.

Key words: Spinal cord stimulator, spinal cord stimulation, failed back surgery syndrome, kyphoscoliosis, back pain, lumbar radiculopathy

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A treatment modality for chronic pain refractory to other therapies with failed back surgery syndrome (FBSS) is spinal cord stimulation (SCS) (1-5). FBSS can cause lumbar radiculopathy with limited evidence of long-term relief achieved with epidural injections (6). FBSS can develop after multiple staged surgeries for scoliosis correction. Elderly patients with significant co-morbidities may be at high risk for extensive surgical procedures for scoliosis correction.

SCS involves a minimally invasive procedure with placement of a pulse generator connected to one or 2 leads placed in the epidural space. SCS may present a therapeutic option with lower risks than scoliosis surgery, especially for patients with increased preoperative risk factors. McLeod et al (7) found that for FBBS

chronic pain treatment, SCS provided superior pain relief and was more cost effective than surgical reoperation; these authors suggested SCS consideration for initial pain management in this population. Axial rotation of the vertebral bodies and angulations of the spinal processes with kyphoscoliosis (7) can present technical challenges during device placement for SCS.

This case presents an approach to placement of a spinal cord stimulator with kyphoscoliosis for chronic pain treatment. To the best of our knowledge, this approach in a patient with kyphoscoliosis for SCS has not been previously described.

Case Report

A 72-year-old female presented with a 5-year history of nonrelenting radicular pain radiating from the lumbar spine to the left lower extremity. Current medications were gabapentin and hydrocodone. Pain ranged from 4 to 7 on a visual analogue scale (VAS) of 0 to 10 with the patient reporting undesired sedative effects. Bowel and bladder function were intact. She denied any lower extremity changes (skin, hair, or nails), abdominal or pelvic pain, fever or chills, night sweats, or weight loss. Her past medical history was significant for kyphoscoliosis, atrial fibrillation without anticoagulation therapy, and peptic ulcer disease. Past surgical history included 3 previous spinal surgeries followed by postoperative aquatic therapy and physical therapy. She had received a total of 9 transforaminal epidural steroid injections (3 cycles, each involving 3 injections) performed at other facilities with pain relief lasting 48 hours.

On physical examination, the patient could not walk on her heels or toes, and had limited range of motion in the lumbar region. There was decreased the pinprick sensation in the left L5 nerve distribution. In lower extremities, motor strength and deep tendon reflexes were normal. Dorsalis pedis and posterior tibial pulses were present bilaterally. Straight leg raise was positive on the left side at 20 degrees. There was tenderness to palpation over the lower lumbar facet joints and left sacroiliac joint. Lumbar and thoracic spines were kyphoscoliotic with a posterior lumbar fusion scar. Oswestry disability index (8,9) was 48% indicating severe disability.

The plain film series revealed a degenerative spine with left lumbar scoliosis with the apex at L2 and a compensatory right thoracic curve (Fig. 1). The left had a 56-degree Cobb angle (Fig. 2) while the right had an 18-degree Cobb angle. A computed tomography (CT) myelogram demonstrated osteopenia, lumbar scoliotic curvature, and narrowing of the spinal canal narrowing throughout the thoracic and lumbar spine (Figs. 3 and 4). A nondisplaced wedge compression fracture was present at T10 with surgical changes related to a previous posterior spine fusion with intervertebral disc spacers present from L3-L5. Nerve conduction studies and electromyography confirmed the diagnosis of chronic L4 and L5 radiculopathy.

Therapeutic options were presented to the patient including SCS with the patient desiring further SCS evaluation. Risks were explained including potential technical difficulties caused by spinal stenosis and kyphoscoliosis. Subsequent psychological evaluation was satisfactory and the patient opted to proceed with SCS. To avoid potential difficulties that might be encountered with repeat procedures, permanent lead(s) were chosen for the trial period.

Previous posterior spinal fusion from L2 to L5 precluded these levels for initial lead placement. The best location for initial lead placement after review of studies was determined to be L1-L2. Initial lead implantation would be performed with the patient conscious for assessment. The success of the initial lead placement would determine if an additional lead was required. Using fluoroscopic guidance, a Precision linear 8 contact lead (Boston Scientific Company, Natick, MA) was placed using a paramedian approach at L1-L2 and then threaded midline. Because of the patient's significant spinal curvature, fluoroscopic visualization via an oblique view was difficult. To visualize the epidural lead during cephalad advancement required altering the fluoroscopic angle with each level when visualizing the vertebral body to achieve an adequate anterior-posterior view. Paresthesia did not occur during initial lead placement or advancement. Substantial pain relief was obtained thus obviating the need for an additional lead.

Pain relief continued and 3 days later a battery was implanted and connected to the permanent lead to allow long term use. The Oswestry disability index (8,9) had improved to 16% indicating minimal disability after 10 weeks of SCS. At 14 weeks after SCS implantation, VAS score was 0 with increased physical activity; the patient was able to discontinue hydrocodone and gabapentin.

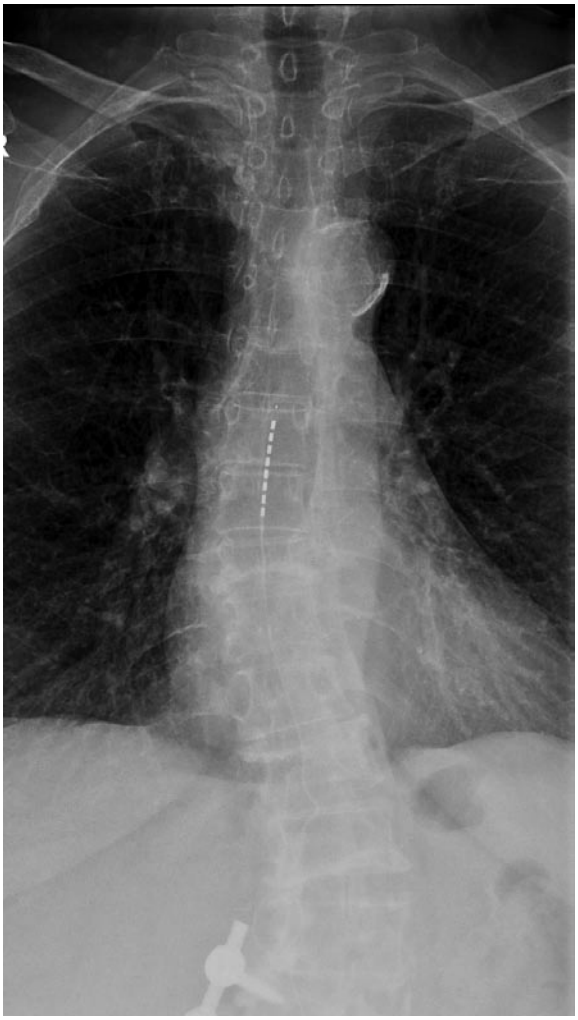

Fig. 1. *Anterior - posterior view of the thoracic spine shows spinal cord stimulator lead at the level of T7-8 levels*

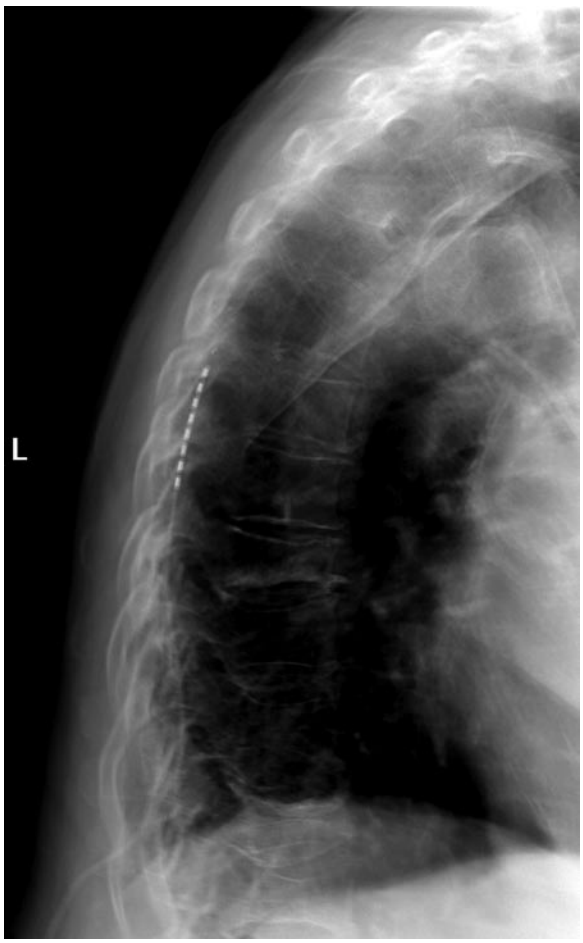

Fig. 2. *Lateral view after placement of Spinal cord stimulator lead shows the lead in the posterior epidural space at the level of T7-8*

Discussion

The current case report highlights some of the technical difficulties in providing SCS treatment with kyphoscoliosis. Despite the potential advantages of this minimally invasive treatment option, the authors were unable to locate a prior report of successful placement of a SCS in a patient with kyphoscoliosis. The patient's kyphoscoliosis presented anatomic challenges. Radiographs of the lumbar and thoracic spine did reveal that anatomic placement of leads might be possible at L1-L2. Moderate spinal stenosis can also present potential challenges to epidural lead placement and threading.

The first technical challenge was entering the epidural space. Posterior spinal fusion from L2-L5 precluded entry at these levels. The L1-L2 level was able to be visualized in the anterior-posterior view as a possibility. A paramedian approach was used to enter the epidural space at this level. Once the epidural space was entered and the lead placed

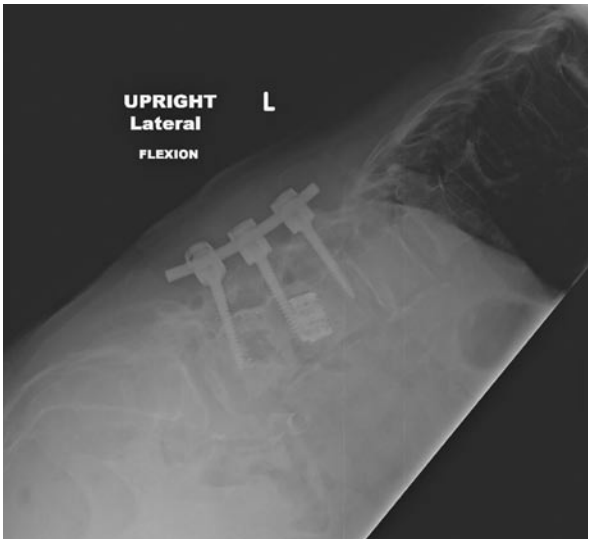

Fig. 3. *Lateral view of the thoracic and lumbar spine shows a nondisplaced wedge compression fracture was present at T10 with surgical changes related to a previous posterior spine fusion with intervertebral disc spacers present from L3-L5.*

midline, the next technical challenge was midline advancement of the lead to the desired spinal column level. This involved rotating the angle of the fluoroscopy at each vertebral level to optimize visualization as the lead was advanced. Due to these technical challenges, a permanent lead rather than a temporary lead was initially placed and connected to the skin externally for the trial period and used for the final SCS implantation. Only one lead was required because it provided excellent coverage.

Conclusion

Scoliosis can require multiple spinal surgical procedures for correction. This may result in FBSS with radiculopathy and chronic pain. Epidural steroid injections, as in this case, may not provide long-term pain relief. SCS can be a treatment option for FBSS and is minimally invasive. In this case, kyphoscoliosis with its anatomy presented a technical challenge for epidural lead placement required for SCS. SCS placement requires careful patient selection and technical expertise with kyphoscoliosis. This case is unique because it presents the issues in evaluating the kyphoscoliotic patient for placement of a SCS and the technical challenges

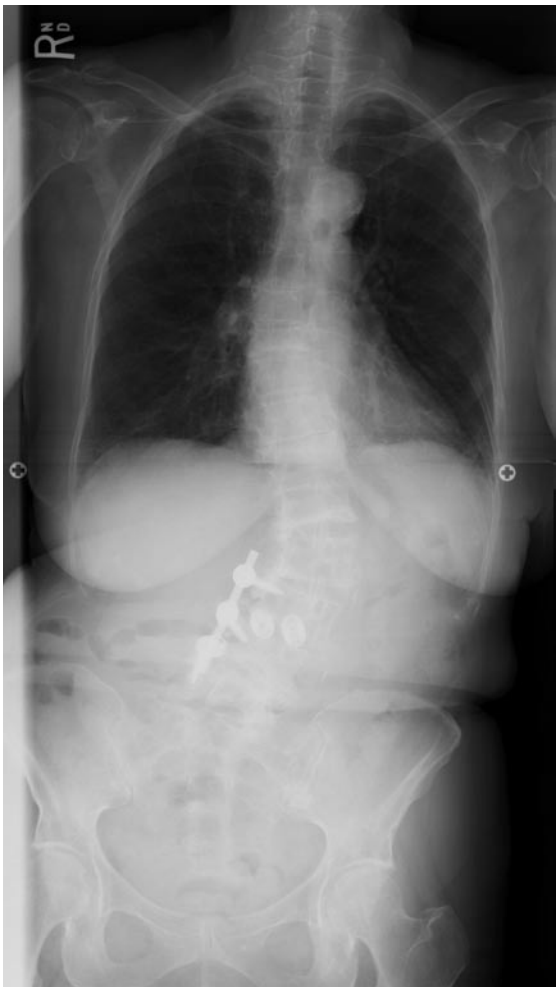

Fig. 4. *The plain film Scoliosis series revealed a degenerative spine with left lumbar scoliosis with 56-degree Cobb angle with the apex at L2 and a compensatory right thoracic curve at18-degree Cobb angle.*

with placement of epidural stimulator leads. Although each case must be carefully evaluated with kyphoscoliosis, this case illustrates that thorough evaluation provided an anatomic level that was a possibility despite the spinal deformity. Midline epidural lead placement and its subsequent threading cephalad required rotating the fluoroscope for adequate visualization at each level. The SCS had excellent therapeutic results in this patient and should be at least evaluated as an option in other cases, taking into account the anatomic challenges.

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