LETTER TO THE EDITOR

Tethering Technique for Revision of a Thoracic Spinal Cord Stimulator Paddle: A Case Report

To the Editor:

Revision of a displaced permanent spinal cord stimulator paddle lead presents certain challenges, not least of which is how to maintain the implant in the correct position. The author recently encountered a patient whose thoracic lead, which was originally placed in the midline, migrated into the lateral gutter. As a fibrous sheath had already formed around the lead in the displaced position, simply moving it back to the midline was felt to have a low probability of success. The author was able to successfully reposition the implant and anchor it with a technique that was recently presented for use in the cervical spine (1).

CASE REPORT

A 66-year-old male developed back pain with radiation to both buttocks and posterior thighs 5 years ago. There was no history of trauma. His pain increased with standing and bending. He obtained relief from lying on his right side. He had no numbness, weakness, or paresthesias. He ambulated with a cane with a limp on the right. Reflexes were intact in the lower extremities. Pinprick sensibility and manual motor testing of the lower extremities were normal. An MRI of his lumbar spine showed degenerative changes from L3 to S1. He had been treated with pain medications (including antiepileptics, vicodin, and fentanyl patches), epidural blocks, and facet injections without improvement. He had a spinal cord stimulator trial with two eight-contact leads centered over T8 for five days with greater than 50% improvement in his pain. He underwent implantation of a St. Jude Penta lead through a laminotomy at T8–T9 and placement of a rechargeable battery above the left hip (Fig. 1). Plastic sleeves were placed over the tails of the lead, which were anchored on each side of the spinal process of T9 with two sutures of 2-0 Ethibond (Johnson and Johnson, New Brunswick, NJ) passed through a hole in the spinous process of T9 (Fig. 2). A free needle was used to pass the tether sutures under the lamina of T8 from cephalad to caudal. This suture was tied to the free ends of the suture, which had been passed through the lead. The free suture was then used to pass the tether sutures under the lamina of T8 from T8–T9 to T7–T8. The tethers were then used to guide the paddle under the lamina of T8 from caudal to cephalad. A penetrating towel clip was used to create a hole in the spinous process of T6. A free needle was used to pass one tether through the hole in T6. The tethers were then tied together. This ensured that the paddle would remain in the midline (Fig. 3). Although the plastic sleeves were left in place, no attempt was made to anchor the lead at the tail end. The entire procedure took under an hour and was performed on an outpatient basis. There was no need to expose the battery or to implant a new lead. There has been no further displacement of the lead as noted on the x-ray made eight months after the repositioning procedure (Fig. 4). The patient is now receiving satisfactory stimulation and relief of his back and leg pain.

DISCUSSION

Lead migration is a common form of spinal cord stimulator failure. Kemler (2) implanted permanent percutaneous stimulators in 24 patients. Five had "complications related to unsatisfactory position of the electrode." Kumar (3) reported on 121 patients and noted electrode displacement or fracturing among the notable complications. Cameron (4) found that the most common form of mechanical failure was lead migration at 13%. Kumar (5) also noted that "Electrode migration is considered as one of the most frequent complications of SCS." Turner (6) also noted that lead migration was a

Address correspondence to: Jacob Amrani, MD, Deer Valley Spine Center, Phoenix, AZ 85027 USA. Email: dramrani@yahoo.com

For more information on author guidelines, an explanation of our peer review process, and conflict of interest informed consent policies, please go to http://www.wiley.com/bw/submit.asp?ref=1094-7159&site=1

Conflict of Interest: The author has no conflict of interest regarding the subject of this paper.
common cause of failure to achieve pain control with spinal cord stimulation. It is unknown when the current patient’s implant migrated as no x-rays were obtained until he complained of loss of back stimulation three months after implantation. The fact that a fibrous sheath was found around the lead that required dissection on the right side implies that the displacement occurred earlier than the patient’s reported loss of stimulation. However, the technical challenge remains the same, i.e., how to replace the lead in the midline and keep it there.

**Figure 1.** X-ray at implantation.

**Figure 2.** X-ray at three months showing the cephalad end of the lead displaced laterally to the left.

**Figure 3.** (a) The sutures are passed through the four corners of the lead with an 18-gauge spinal needle. (b) The ends of the sutures exit the leading edge of the implant. (c) The sutures are passed beneath T8 and T7, pulling the implant into the spinal canal from caudal to cephalad. They are then tied together through a hole in the spinous process of T6. No anchor is used at the tail end.
Repositioning the implant can be challenging, especially if the implant has to remain at the same level. In delayed cases, a fibrous sheath may form around the implant impeding the return of the paddle to its original position. A laminectomy will make it easier to position the lead, but it will also make it easier for the lead to displace a second time. Finally, the issue arises of how to fix the implant in place during the revision and prevent a second migration.

Henderson (7) recommended against the routine use of anchors. Although the current author uses plastic anchor sleeves in the thoracic spine, their use did not prevent the migration that occurred in this case. It did not seem rational to expect that simply repositioning the lead and repeating the fixation strategy with new or the same anchors placed at the tail end would have prevented the lead migration from recurring. Feller (8) reported on 20 paddle leads that were inserted over the ring of C1 and were sutured to the dura. There was one infection, but no episodes of lead migration. However, Kumar (5) and an expert panel advised against fixing the implant to the dura. It was felt that doing so would increase the risk of implant breakage. Suturing to the dura also raises concerns about future elective implant removal, especially if the patient presents to another surgeon who may not know of the dural fixation.

The technique reported here was originally developed for implantation in cervical spine, where the increased mobility has led to a high incidence of lead migration in the author’s experience. Lateral migration has been less of a problem in the thoracic spine in this author’s experience, especially with the larger St. Jude tripole and Penta leads. In this case, this technique provided a quick and easy solution. Suturing the implant to a spinal process ensures that the implant will be placed in and remain in the midline. Avoiding the dura eliminates any concerns about cerebrospinal fluid leak or meningitis if an infection ensues. Removal is equally easy by simply cutting the tether at the hole in the spinous process. No anchoring was required at the tail end of the lead.

CONCLUSION

Passing a suture through the corners of a paddle lead and using this suture to anchor the lead to the cephalad spinous process appears to be a simple solution to return a laterally migrated lead to the midline.

Authorship Statement

Dr. Amrani is the sole author.

Jacob Amrani, MD
Deer Valley Spine Center, Phoenix, AZ, USA

REFERENCES


Keywords: Neuromodulation, paddle failure, tethering technique