Safety Profile of Spinal Cord Stimulator Paddle Lead Revision and Replacement

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BACKGROUND

- Spinal cord stimulation (SCS) is a neuromodulatory treatment for patients experiencing chronic pain resistant to conservative therapies. It is often used for post-laminectomy syndrome, complex regional pain syndrome, and neuropathic pain.
- SCS leads can be categorized into percutaneous leads and paddle leads, the latter requiring a laminectomy for implantation.
- The advantages of paddle leads include lower migration rates and more efficient energy delivery.
- Revision surgery may be required in instances of lead failure, migration or misplacement. Paddle lead replacement can be challenging due to extensive scar tissue formation, often requiring additional dissection.
- Reoperation for paddle leads has raised concerns about morbidity specific to paddle lead reoperation.

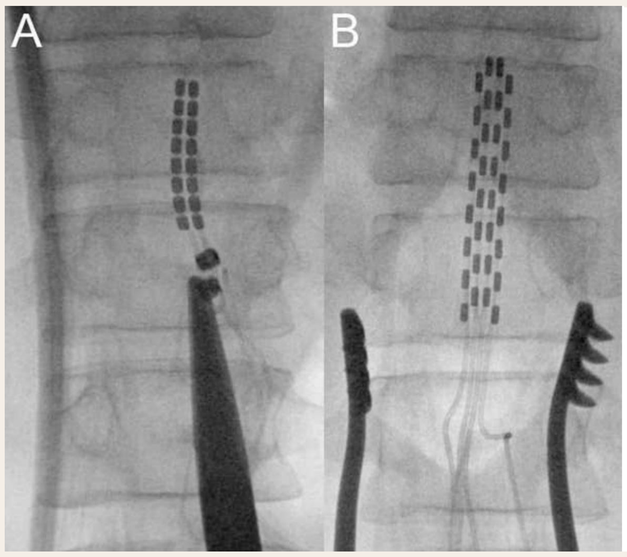

Figure 1: Initial lead is placed too far laterally and is also partially withdrawn into the epidural space at the laminectomy site (A). Revision is performed with a larger paddle and placed in anatomic midline (B).

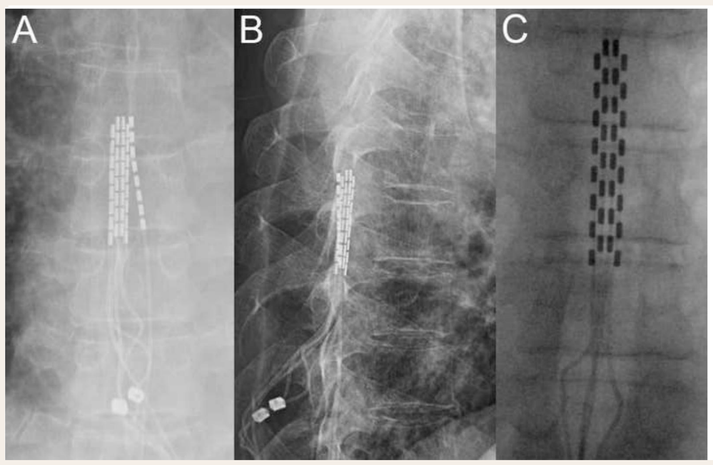

Figure 2: Initial lead is placed too far laterally (A,B). Revision is performed with a larger paddle and placed in anatomic midline (C).

METHODS

- This study is a retrospective single-center case series of patients who underwent revision and replacement of a paddle SCS due to initial lead misplacement.
- Demographic data, operative factors, pain ratings, and complications were recorded for each patient.

RESULTS

- A total of 16 patients underwent revision and replacement of a misplaced SCS paddle.
- The mean duration from initial implantation to revision surgery was 44.8±47.5 months.
- The mean operative duration was 126.1±26.9 minutes.
- Misplaced paddles were too lateral (n=12), too high (n=2), or incompletely within the epidural space (n=2).
- All patients required a “skip” laminectomy or laminotomy due to scar tissue from the misplaced lead.
- No intraoperative or postoperative complications were encountered in any of the procedures.
- The mean length of follow-up was 18.4±7.3 months.
- Mean preoperative pain intensity was 7.9±1.5, and at last follow-up was 3.6±1.7 ($p<0.001$).
- One patient underwent removal due to loss of efficacy at 14 months following revision.

CONCLUSION

- Additional dissection and bone removal was necessary for all patients due to an extended time interval from initial implantation to replacement. Nevertheless, all patients underwent successful clearance of scar tissue and new paddle placement in the optimal midline position.
- All patients experienced satisfactory bilateral pain coverage and improved pain outcomes following revision, with only a single patient requiring paddle lead removal 14 months post-revision surgery. Five patients underwent replacements with a larger paddle, which is a potential factor in improved pain coverage.
- All replaced leads in our study were confirmed to have been misplaced during initial placement, rather than having migrated after placement, consistent with the infrequency of paddle lead migration.
- Our study showed that the revision and replacement of misplaced paddle SCS leads can be safely performed, yielding effective and durable outcomes. Our findings support the consideration of revision in cases of misplaced paddles to restore pain control. This insight can guide physicians in counseling patients experiencing misplaced paddles, as well as in decision-making regarding the use of paddle leads.