

Multicolumn Spinal Cord Stimulation for Solitary Perineal Pain : A Case Report

Taehun Moon, MD, Won Seok Chang, MD, Hyun Ho Jung, MD, PhD, Jin Woo Chang, MD, PhD

Division of Stereotactic and Functional Neurosurgery, Department of Neurosurgery, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea

Pudendal neuralgia is a chronic, disabling form of perineal pain. Although the effect of stimulation on neuropathic pain is well documented, the ideal management for pudendal neuralgia is not yet defined. We present a case of successful pain modulation using a multicolumn electrode to stimulate the dorsal column of a patient with medical refractory solitary perineal pain. The patient had received several surgical treatments for chronic and radiating pain in the lumbar area, as well as suffered from a severe disability because of perineal pain that worsened on sitting. A trial electrode insertion at the T12 level was performed using a multicolumn electrode, and the responses were blindly tested for a week. Stimulation resulted in a significant reduction in the patient's pain, thus dropping the numeric rating scale (NRS-11) from 8 to 3 and lengthening his sitting time and improving his quality of life. Spinal cord stimulation using a multicolumn electrode may be a viable treatment option for patients with medical refractory solitary perineal pain.

KEY WORDS: Spinal cord stimulation · Perineal pain.

INTRODUCTION

Pudendal neuralgia (PN) is the most chronic and disabling form of perineal pain. Labat, et al.⁷⁾ proposed the Nantes criteria, which is composed of 5 essential criteria: 1) pain in the territory of the pudendal nerve : from the anus to the penis or clitoris, 2) pain is predominantly experienced while sitting, 3) the pain does not wake the patient at night, 4) pain with no objective sensory impairment, and 5) pain relieved by diagnostic pudendal nerve block, with a few exclusion criteria : 1) exclusively coccygeal, gluteal, pubic or hypogastric pain, 2) pruritus, 3) exclusively paroxysmal pain, and 4) imaging abnormalities that can account for the pain. Various treatment methods are used, including medication, transcutaneous electrical nerve stimulation, and decompression of the pudendal nerve. However, 30% of patients achieve little or no pain relief following nerve decompression.¹⁾¹¹⁾ Retrograde stimulation of the S3 nerve roots is pos-

sible, but is associated with technical difficulties and a high failure rate.

Spinal cord stimulation (SCS) has been proven to relieve chronic intractable pain.⁵⁾⁶⁾¹⁰⁾ A new-generation 16 contact multicolumn lead that is used to treat pudendal neuralgia has been reported.¹⁰⁾ This lead allows various combinations of transverse and longitudinal tripolar configurations, permits the generation of a differential current between the independent stimulation columns in the deep layers of the dorsal columns,¹⁰⁾ and reduces unwanted side effects such as dorsal root stimulation.

We report a case of successful pain modulation with a multicolumn electrode in a patient with drug refractory solitary perineal pain after multiple spine surgeries.

CASE REPORT

A 67-year-old male patient visited our department because of severe solitary perineal pain for several years, with a pain intensity score of 8 on the numeric rating scale (NRS-11). The pain has developed after receiving multiple spine surgeries, suggesting nerve injury. He had difficulty maintaining the sitting position. This severely affected his quality of life. The patient did not have any relevant medical or traumatic history besides having undergone several operations at the lumbar spine. Medications, including opioid analge-

Address for correspondence: Hyun Ho Jung, MD, PhD, Division of Stereotactic and Functional Neurosurgery, Department of Neurosurgery, Yonsei University College of Medicine, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea
Tel: +82-2-2228-2165, Fax: +82-2-393-9979
E-mail: JUNGH@yuhs.ac

This research was supported by a grant to CABMC (Control of Animal Brain using MEMS Chip) funded by Defense Acquisition Program Administration (UD140069ID).

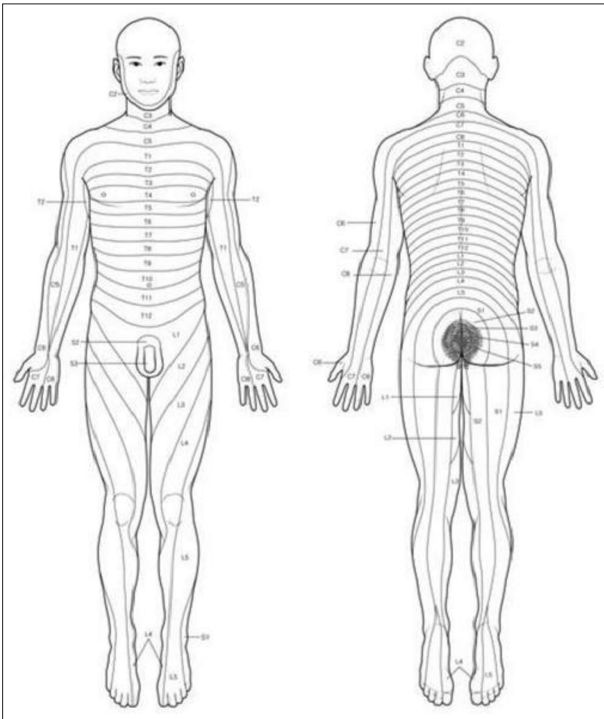


Fig. 1. Perineal pain depicted on a dermatome map.



Fig. 2. Preoperative imaging studies; sagittal computed tomography showing multiple compression fractures with previous vertebroplasty (left), and x-ray showing posterior instrumentation at L1-L2 level (right).

sics, and various types of pain block modalities did not relieve the pain significantly. He experienced solitary perineal pain, predominantly while sitting (Fig. 1). The pain did not affect his sleep and there were no sensory complaints. A retrograde S3 peripheral nerve stimulation was not possible because of previous operation scars and adhesion of the surrounding tissues. Therefore, the patient met 4 of the 5 Nantes

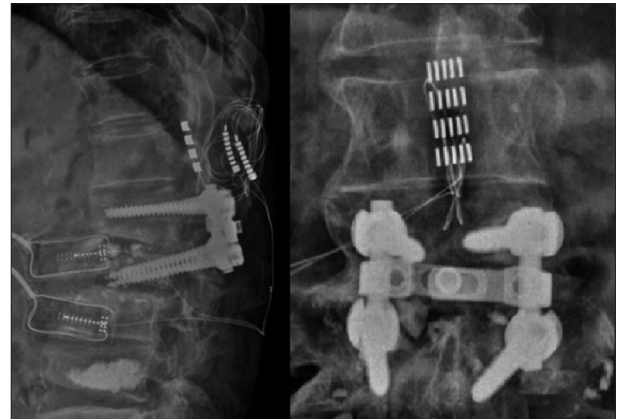


Fig. 3. Lateral (left) and AP (right) view x-rays taken after electrode implantation.

criteria.

Preoperative computed tomography and radiography findings were as follows : a percutaneous vertebroplasty at L2 and L4 compressed fractured bodies, a laminectomy through L3/4/5, and posterior instrumentation and fixation at L1 to L2 (Fig. 2).

We implanted a 5-column paddle electrode (Penta™; St. Jude Medical, Plano, Texas, USA) at T12 (Fig. 3), placement of which at a more caudal position was not possible because of the formation of postoperative adhesion tissue. The settings were as follows : contacts 9 and 10 as cathode, contacts 6 and 14 as anodes, an amplitude of 3.2V, and a pulse width of 400 microseconds with a rate of 60Hz (Fig. 4). After implantation of the trial electrode, blind on or off test stimulations were done at the ward for a week. There was a significant reduction in the patient's pain. The VAS was reduced to 4. The implantable pulse generator was implanted a week after the test stimulation. The patient was able to maintain the sitting position for several hours after implantation of the stimulator. He was discharged with minimal perineal pain (NRS 3 out of 10) and no complications. At short term follow up at the outpatient clinic, we could discontinue some of the medications he has been taking.

DISCUSSION

Although the ideal management for pudendal neuralgia is not yet defined,³⁾ the effect of stimulation in neuropathic pain is well documented,⁶⁾⁸⁾⁹⁾ with satisfactory results in 40–80% of cases.²⁾⁴⁾⁸⁾ Kevin et al. reported 27 consecutive cases of spinal cord stimulation of the conus medullaris for refractory pudendal neuralgia, where 20 (74%) patients showed sig-

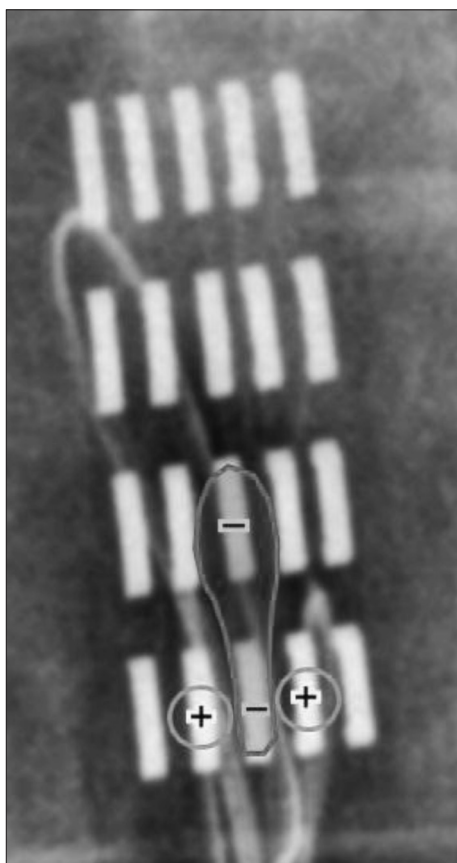


Fig. 4. Stimulation configuration of electrode using guarding technique stimulation which is an advantage of the multicolumn electrode.

nificant improvement.²⁾

Objective evaluation of symptom improvement in neuropathic pain is often difficult.²⁾ In pudendal neuralgia, the main complaint is a poor quality of life because of limited sitting time. It may affect the patient's life in many ways, including limiting time spent seated while having a meal, driving, and any other activity that requires sitting for a long time.²⁾ Thus, the maximum length of time for which a patient can sit may be an objective way of evaluating treatment results.

The neurophysiologic mechanisms of action of spinal cord stimulation are not completely understood yet. The gate control theory, although incomplete, is credited for providing a possible mechanism for the efficacy of spinal cord stimulation in pain relief.¹²⁾ In the gate control theory, electrical stimulation to the spinal cord would preferentially stimulate the large fibers (responsible for touch and vibration) and blocks transmission through the small fibers (pain) to the brain.¹²⁾ However, the gate control theory does not explain why neuropathic pain is selectively targeted and nociceptive

pain is largely spared.¹²⁾

The optimal stimulation electrode has not yet been defined. Previous literature shows no significant difference in improvement regarding a single-column, a two-column, or a three-column stimulation.²⁾ The advantage of the single-column electrode is that it can be inserted by transcutaneous or minimally invasive techniques. In our case, by using a multicolumn electrode, we were able to perform the guarding technique (tripolar transverse configuration) to avoid inadequate paresthesia coverage. By using the guarding technique, we were able to increase the depth of stimulation without making excessive current around the stimulation point. Also precise electrode placement to the midline is easier with a multicolumn electrode, as the coverage is more broad than the single-column electrode. A large-scale prospective randomized study would be required to guide the choice of stimulation electrode.

CONCLUSION

Our case shows that multicolumn electrode stimulation, which targets the conus medullaris, may be a treatment option for solitary perineal pain which is maintained after multiple spinal surgeries.

REFERENCES

1. Benson JT, Griffis K: *Pudendal neuralgia, a severe pain syndrome. Am J Obstet Gynecol* 192:1663-1668, 2005
2. Buffenoir K, Rioult B, Hamel O, Labat JJ, Riant T, Robert R: *Spinal cord stimulation of the conus medullaris for refractory pudendal neuralgia: a prospective study of 27 consecutive cases. NeuroUrol Urodyn* 34:177-182, 2015
3. Carmel M, Lebel M, Tu le M: *Pudendal nerve neuromodulation with neurophysiology guidance: a potential treatment option for refractory chronic pelvi-perineal pain. Int Urogynecol J* 21:613-616, 2010
4. Epstein LJ, Palmieri M: *Managing chronic pain with spinal cord stimulation. Mt Sinai J Med* 79:123-132, 2012
5. Kemler MA, de Vet HC, Barendse GA, van den Wildenberg FA, van Kleef M: *Effect of spinal cord stimulation for chronic complex regional pain syndrome Type I: five-year final follow-up of patients in a randomized controlled trial. J Neurosurg* 108:292-298, 2008
6. Kumar K, Taylor RS, Jacques L, Eldabe S, Meglio M, Molet J, et al: *The effects of spinal cord stimulation in neuropathic pain are sustained: a 24-month follow-up of the prospective randomized controlled multicenter trial of the effectiveness of spinal cord stimulation. Neurosurgery* 63:762-770; discussion 770, 2008
7. Labat JJ, Riant T, Robert R, Amarenco G, Lefaucheur JP, Rigaud J: *Diagnostic criteria for pudendal neuralgia by pudendal nerve entrapment (Nantes criteria). NeuroUrol Urodyn* 27:306-310, 2008
8. Mailis A, Taenzer P: *Evidence-based guideline for neuropathic pain interventional treatments: spinal cord stimulation, intravenous infusions, epidural injections and nerve blocks. Pain Res Manag*

17:150-158, 2012

9. North RB, Kidd DH, Piantadosi S: *Spinal cord stimulation versus re-operation for failed back surgery syndrome: a prospective, randomized study design. Acta Neurochir Suppl 64:106-108, 1995*
10. Rigoard P, Delmotte A, Moles A, Hervochon R, Vrignaud T, Misbert L, et al: *Successful treatment of pudendal neuralgia with tricol-umn spinal cord stimulation: case report. Neurosurgery 71:E757-762; discussion E763, 2012*
11. Robert R, Labat JJ, Bensignor M, Glemain P, Deschamps C, Raoul S, et al: *Decompression and transposition of the pudendal nerve in pudendal neuralgia: a randomized controlled trial and long-term evaluation. Eur Urol 47:403-408, 2005*
12. Song JJ, Popescu A, Bell RL: *Present and potential use of spinal cord stimulation to control chronic pain. Pain Physician 17:235-246, 2014*