

IS BIPOLAR DORSAL ROOT GANGLION PULSED RADIOFREQUENCY EFFECTIVE IN THE TREATMENT OF POSTINJECTION SCIATIC NERVE NEUROPATHY: CASE REPORT

Çiğdem Yalçın, MD

Background: Nerve injury is a common complication of intramuscular (im) injection and the sciatic nerve (SN) is the most frequently affected nerve. Pain management in neuropathic pain due to sciatic injury is challenging.

Case Report: A 66-year-old man admitted with neuropathic pain in his right leg. The pain commenced 6 years ago after an im injection into the right hip.

Conclusions: Interventional treatment methods are not favored in the treatment of SN neuropathy subsequent to injection injury. However, bipolar pulsed radiofrequency treatment to L4-L5-S1 dorsal root ganglia may be an effective intervention in intractable sciatic neuropathy.

Key words: Sciatic nerve, neuropathic pain, bipolar, pulsed radiofrequency, case report

BACKGROUND

Nerve injury is a common complication of intramuscular (im) injection and the sciatic nerve (SN) is the most frequently affected nerve (1). SN progresses through the midgluteal region; therefore, it is obligatory to carry out injections in the upper outer quadrant. Injections at inappropriate locations or spread of injected potentially neurotoxic drugs may result in nerve injury. SN injection injury may present a wide range of manifestations varying from minor transient pain without neurological sequelae to severe sensorial symptoms and motor loss (2).

It is challenging to relieve neuropathic pain due to sciatic injury. Neuropathic pain may be alleviated with gabapentinoids and tricyclic antidepressants (3) or surgical exploration may be utilized for incapacitating or complete motor deficit of the tibial or peroneal distribution (4). Radiofrequency (RF) application to the dorsal root ganglion (DRG) is not a standard method used in the management of neuropathic pain due to SN damage.

To date, there are no studies or case reports that administer bipolar RF to L4-L5-S1 DRGs for the treatment of neuropathic pain due to SN damage by im injection. We describe a responsive treatment of sciatic neuropathy with the bipolar RF technique.

CASE REPORT

A 66-year-old man applied to our clinic with the complaint of right leg pain. The pain started after an im injection into the right hip 6 years ago and radiated to the foot. The pain level was 9/10 with the Numeric Rating Scale (NRS-11) score. The pain was neuropathic and the patient described tingling, burning, prickling, and itching. On physical examination, there was loss of strength in the right foot, the dorsiflexion of the right foot was 2/5.

The patient previously applied to the neurology clinic. Electromyography was made, and on the right lower extremity, a chronic moderate partial lesion of the peroneal branch of the SN and moderate chronic

From: Mersin City Training and Research Hospital, Mersin, Turkey

Corresponding Author: Çiğdem Yalçın, MD, E-mail: mdcigdem@gmail.com

Disclaimer: There was no external funding in the preparation of this manuscript.

Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

Patient consent for publication: Consent obtained directly from patient(s).

Authors adhere to the CARE Guidelines for writing case reports and have provided the CARE Checklist to the journal editor.

Accepted: 2023-08-10, Published: 2023-11-30

L5 radiculopathy were determined. Pregabalin 150 mg bid po and oxycodone 10 mg qid po were started by a neurologist. There was a small relief in pain with these drugs. Pregabalin was increased to 225 mg bid but the patient had dizziness, so he did not want to take this dose. It was changed back to 150 mg bid again. Thereupon, the patient was referred to the algology clinic.

Lumbar magnetic resonance (MR) images were obtained to rule out simultaneous lumbar disc herniation. The MR and also blood analysis were normal. Then, pulsed RF (PRF) was planned for the SN. PRF applied under ultrasonography guidance (Fig. 1). The in-plane technique was used with a C1-5-D convex probe (GE Healthcare, Chicago, Illinois) and the right SN was found in the transgluteal area, PRF was performed (2 Hz frequency, 45 V, and 20 ms pulse interval, at 42 °C) for 4 minutes. After 15 days, the patient was called for control, but there was no reduction in pain. Then bipolar PRF was applied to L4-L5 and S1 DRGs in September 2022. Two Quincke-type 22-G catheters (TOP Neuropole needle, 100 mm with a 10-mm active tip, TOP Corp, Japan) were inserted in the intervertebral foramen (Fig. 2) and a sensory stimulation test was conducted using an RF generator (TOP Lesion Generator TLG-10, TOP Corp, Japan). Each catheter needle was advanced to the DRG until the patient reported a tingling sensation and/or dysesthesia at < 0.3 V. The distance between the 2 catheter needle tips was < 10 mm (5), but they were not in contact with each other. The PRF treatment was

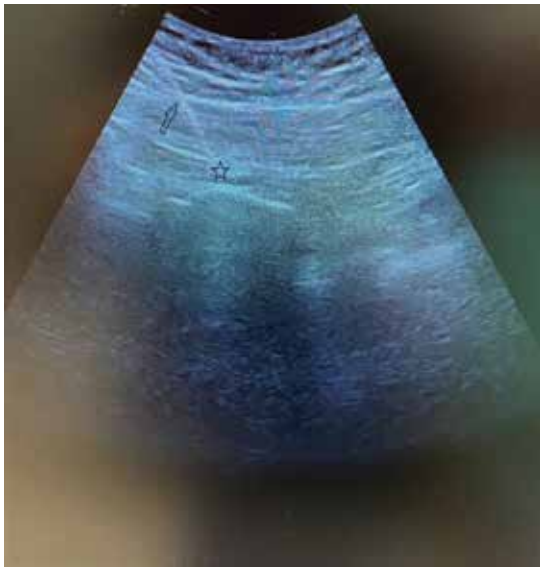


Fig. 1. USG guidance sciatic nerve pulsed radiofrequency. arrow: needle, star: sciatic nerve

administered at 2 Hz frequency, 45 V, 20 msn pulse interval, for 2 minutes with the electrode tip temperature at 42 °C. The first control was after 5 days and the pain had decreased to the NRS-11 level of 5/10. Oxycodone was reduced to 4*5 mg. The second control was after 15 days and the pain level was 3/10, so oxycodone was reduced to 2*5 mg. At follow-up, one month later, the pain level decreased to 2/10 and oxycodone was stopped. At the sixth-month control, the NRS-11 score was 4/10 and the pregabalin dose could not be reduced. Also, no improvement in motor loss. Now, the patient uses only 2*150 mg of pregabalin.

DISCUSSION

A responsive treatment of sciatic neuropathy with bipolar RF technique was described in this case.

It is very difficult to relieve neuropathic pain due to injection injury. Despite several treatment types, many patients fail to make a full recovery. It was thought that the patient with axonal injury and neuronal sensitization benefited from the applied DRG bipolar RF in the early and medium terms.

An im injection into the buttock potentially risks injury of the SN. Injection-induced sciatic neuropathy is a persistent worldwide problem affecting patients in economically rich and poor countries (6). The effects of injection-related SN injury are variable, ranging from transient sensory disturbance to permanent paralysis and numbness (4). The common peroneal component of the SN is more often affected because of its posterolateral position (7).

Li et al (8) induced neuropathic pain in the SN in 20 rats and randomly divided them into a PRF treatment group and a sham group. The contralateral SN served as a control. PRF treatment groups were treated with a 2 Hz pulse frequency current for 120 seconds at 42 °C delivered by an RF generator. The results suggest that PRF can facilitate the restoration of normal nerve structure and allow for regenerative processes to reverse the effects of compression injury. In this case, PRF application to the SN was not successful. Maybe it was because the damage had occurred 6 years ago. Maybe it would be effective if applied in the acute period, prospective studies are needed for this.

PRF application is also effective for DRG. Aksu et al (9) induced neuropathic pain in rabbits. The rabbits were divided into 3 groups. In groups 1 and 2, the left SN was tightly ligated as a partial ligation model with 4-0 silk sutures. Group 3 was a sham group. PRF was applied

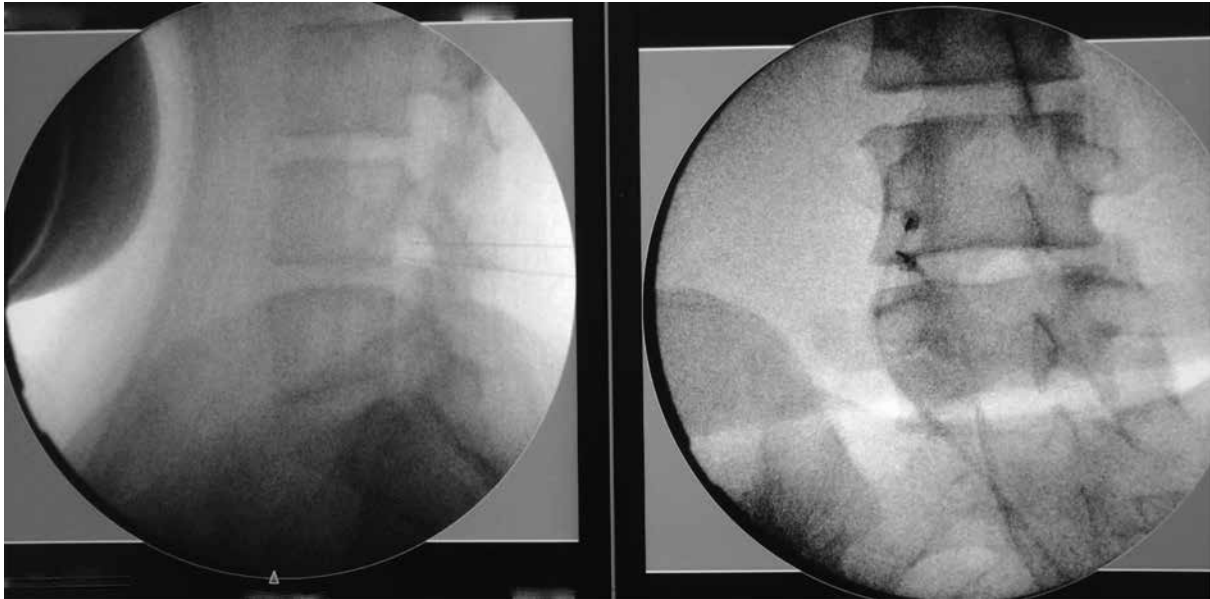


Fig. 2. L4 DRG bipolar pulsed radiofrequency.

to the L5 and L6 dorsal roots at 42 °C for 8 minutes to group 1 rabbits. The responses of all groups to thermal and mechanical stimuli were measured for a period of 4 weeks. There were no statistically significant differences between baseline values and group 1 rabbits' responses to the thermal test 2 weeks after the application of PRF or to the mechanical stimulus 3 weeks after RF application. The decrease seen in group 2 persisted after 4 weeks. They have emphasized that hyperalgesia was reduced by RF application.

In addition, many patients treated in this manner continue to complain of persistent neuropathic pain. PRF is widely used as a safe and efficacious therapy. PRF is effective but insufficient. Although complications and side effects are generally less common compared with RF thermocoagulation, PRF is not as effective as RF thermocoagulation for the relief of neuropathic pain. Therefore, this situation led to the search for a new RF technique, and a novel RF technique - bipolar RF- has been started to be used successfully to treat multiple chronic pain conditions. Bipolar RF seems to be more effective than monopolar PRF in studies. Chang et al (10) compared bipolar PRF and monopolar PRF in chronic lumbosacral radicular pain due to lumbar disc herniation and lumbar stenosis. In both groups, scores at 1, 2, and 3 months were significantly decreased when compared with pretreatment scores. Reductions in the

NRS-11 scores over time were significantly larger in the bipolar PRF group. In addition, the score from pretreatment to each evaluation time point was significantly reduced in the bipolar PRF group compared with the monopolar PRF group. Three months after treatment, 19 patients (76.0%) in the bipolar PRF group and 12 patients (48.0%) in the monopolar PRF group reported successful pain relief (pain relief of $\geq 50\%$). They emphasized that effects of the procedures were sustained for at least 3 months after each procedure. Their results indicate that bipolar PRF is a more effective method for managing chronic lumbosacral radicular pain compared to monopolar PRF. This case also supports that bipolar RF is effective.

Treatment of sciatic neuropathy is quite difficult. The bipolar technique was preferred instead of monopolar RF because of this difficulty and bipolar RF applied to spinal nerves was effective in reducing pain.

CONCLUSIONS

Interventional treatment methods are not preferred in the treatment of sciatic neuropathy due to injection injury.

An interventional technique, bipolar PRF treatment to L4-L5-S1 DRGs may have been effective. Prospective studies are needed to understand the effect of bipolar RF on sciatic neuropathy.

REFERENCES

1. Kim HJ, Park SH. Sciatic nerve injury. *J Int Med Res* 2014; 42:887-897.
2. Plewnia C, Wallace C, Zochodne D. Traumatic sciatic neuropathy: A novel cause, local experience, and a review of the literature. *J Trauma* 1999; 47:986-991.
3. Keskinbora K, Aydinli I. Treatment of neuropathic pain due to sciatic nerve injury following intramuscular injection with gabapentin in a child. *Paediatr Anaesth* 2008; 18:1134-1135.
4. Villarejo FJ, Pascual AM. Injection injury of the sciatic nerve (370 cases). *Childs Nerv Syst* 1993; 9:229-232.
5. Gauci CA (ed). Cosman Medical. In: *Manual of RF Techniques*. Third Edition. Ridderkerk, Netherlands, 2011, pp 24-25.
6. Mishra P, Stringer MD. Sciatic nerve injury from intramuscular injection: A persistent and global problem. *Int J Clin Pract* 2010; 64:1573-1579.
7. Sunderland S. The relative susceptibility to injury of the medial and lateral popliteal divisions of the sciatic nerve. *Br J Surg* 1953; 41:300-302.
8. Li DY, Meng L, Ji N, Luo F. Effect of pulsed radiofrequency on rat sciatic nerve chronic constriction injury: A preliminary study. *Chin Med J (Engl)* 2015; 128:540-544.
9. Aksu R, Ugur F, Bicer C, Menkü A, Güler G, Madenoğlu H. The efficiency of pulsed radiofrequency application on L5 and I6 dorsal roots in rabbits developing neuropathic pain. *Reg Anesth Pain Med* 2010; 35:11-15.
10. Chang MC, Cho YW, Ahn SH. Comparison between bipolar pulsed radiofrequency and monopolar pulsed radiofrequency in chronic lumbosacral radicular pain: A randomized controlled trial. *Medicine (Baltimore)* 2017; 96:e6236.