



Management of Postherpetic Neuralgia with Pulsed Radiofrequency Dorsal Root Ganglion: A Case Report

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ABSTRACT

Introduction: Radiofrequency therapy is a minimally invasive procedure that has been used for about three decades to treat various chronic pain, such as postherpetic pain. This case study aims to describe the use of PRF in postherpetic neuralgia. **Case presentation:** A woman, 71 years old, came with complaints of right low back pain. Pain that is felt like burning, burning, sometimes pain feels like being stabbed, electrocuted, throbbing, and the pain will increase if the area of the skin is touched by a cloth. The pain began to be felt approximately 11 years ago. Physical examination shows vital signs; blood pressure 140/75 mmHg, pulse 76x/minute, respiratory rate 20x/minute, oxygen saturation 97%, temperature 36,5°C, numeric rating scale (NRS) 8-9/10. On examination of the right lumbar region, hypopigmented lesions appeared around the right waist at L3, L4, and L5 levels. No hyperemia and edema were found, and no obvious sensory loss. Assessment of pain score according to the Socrates method 8/10, S-LANSS score (self-report Leeds assessment of neuropathic symptoms and signs) 16. The patient has been diagnosed with postherpetic neuralgia. Patients were treated with a pulsed radiofrequency (PRF) procedure on the dorsal root ganglion (DRG). Pulsed radiofrequency was performed on the dorsal root ganglion at L1, L2, L3, and L4 levels. **Conclusion:** The pulsed radiofrequency procedure on the dorsal root ganglion is a minimally invasive procedure that is effective and safe in treating postherpetic neuralgia pain. The use of imaging guidance in this procedure can improve the accuracy of needle tip placement and prevent side effects and complications.

Keywords: chronic pain, dorsal root ganglion, herpes zoster, postherpetic neuralgia, pulsed radiofrequency.

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Introduction

Postherpetic neuralgia (PHN) is a neuropathic pain syndrome with symptoms of pain that persist months to years after the healing of the herpes zoster (HZ) infection rash.¹ About 5% - 20% of patients who have HZ infection will develop PHN.² PHN is a persistent chronic pain problem that is generally experienced by elderly patients.³ Pain that occurs in PHN can have a severe intensity so that it greatly disrupts the function and quality of the physical, psychological and social aspects of the patient and ultimately reduces the quality of life.⁴ Until now, there has not been found a therapy that can completely prevent or treat pain in PHN.⁵ The existing therapies are only able to shorten the duration of pain or reduce the intensity of pain in PHN.⁶

One of the difficulties in managing PHN is the high variability of PHN symptoms. One patient after another may indicate that there are many molecular mechanisms involved in the pathogenesis of PHN.⁷ A deeper understanding of the molecular mechanism of PHN is urgently needed as a consideration of therapeutic options to improve the quality of life of patients with PHN.

There are several modalities of pain management, including pharmacological therapy ranging from simple to a combination of various types of drugs, there are also non-pharmacological therapies in the form of psychological and physical therapy, but pain, especially chronic pain itself, is still one of the biggest challenges for most experts. In daily practice, due to differences in response from each individual. The commonly used minimally invasive therapies are nerve blocks and pulsed radiofrequency.²

Radiofrequency therapy is a minimally invasive procedure that has been used for about three decades to treat various chronic pain such as postherpetic pain, trigeminal neuralgia, low back pain (LBP), and also complex regional pain syndrome (CRPS).³ Pulsed radiofrequency (PRF) is a process in which short bursts of radio frequency are delivered to the target nerve, which will produce a transduction signal to reduce pain.⁴ PRF is a therapy of neural networks with little neurodestructive possibility and is an alternative technique to continuous RF.⁵ This case study aims to describe the use of PRF in postherpetic neuralgia.

Case Presentation

A woman, 71 years old, came with complaints of right low back pain. Pain that is felt poignant, burning, sometimes pain feels like being stabbed, electrocuted, throbbing, and the pain will increase if the area of the skin is touched by a cloth. The pain began to be felt approximately 11 years ago. The pain was first felt by the patient when small, fluid-filled



vesicle appeared on the skin of the right lumbar region. After the fluid-filled vesicle dries up, the pain doesn't go away. The pain is felt continuously and only decreases slightly after taking pain relievers. Pain is felt to greatly interfere with daily activities and greatly reduce the quality of life, such as experiencing sleep disturbances, inability to concentrate properly, irritability, decreased appetite, and lack of socializing. Based on the history, the patient has a history of controlled hypertension and is allergic to penicillin drugs. Previously, the patient had received pain therapy with pregabalin.

Physical examination shows vital signs; blood pressure 140/75 mmHg, pulse 76x/minute, respiratory rate 20x/minute, oxygen saturation 97%, temperature 36,5°C, numeric rating scale (NRS) 8-9/10. On examination of the right lumbar region, hypopigmented lesions appeared around the right waist at L3, L4, and L5 levels. No hyperemia and edema were found, and no obvious sensory loss. Assessment of pain score according to the Socrates method 8/10, S-LANSS score (self-report Leeds assessment of neuropathic symptoms and signs) 16. Routine blood laboratory evaluation within normal limits. The patient has been diagnosed with postherpetic neuralgia.

Patients were treated with a pulsed radiofrequency (PRF) procedure on the dorsal root ganglion (DRG). Pulsed radiofrequency was performed on the dorsal root ganglion at L1, L2, L3, and L4 levels. The analgesic agent used is lidocaine. After completing the procedure, the patient was given 50 mg/12 hours of pregabalin and 12.5 mg/12 hours of amitriptyline. Follow-up pain intensity after the action can be seen in Table 1.

Table 1. Observation of pain intensity after the action.

Time	Numerical rating scale
1 hour after the procedure	4-5/10
Days +1	4/10
2 weeks after the procedure	2-3/10

Discussion

Herpes zoster is a clinical condition caused by reactivation of the varicella-zoster virus (VZV) which had previously persisted in spinal and cranial sensory ganglia after primary infection with varicella (chickenpox), which usually occurs in childhood. Latent viruses will quickly duplicate when the body's immunity decreases with increasing age. PHN is pain that



persists 1 month after being exposed to acute herpes zoster, and this pain can last for more than 10 years.⁸ Epidemiological studies conducted in the United States have shown that nearly all of the adult population has latent VZV in their bodies and are, therefore, at risk for developing herpes zoster. The VZV that causes HZ can persist in the DRG of the spinal cord for a long time after infection. Latent viruses can replicate rapidly if the body's immune system is weakened. Old age is more frequently affected by HZ with PHN complications.⁹

There are several dermatomes that are predilected for VZV latency. This is influenced by the density of skin lesions in varicella. The more and denser the skin lesions in a dermatome, the more virus will travel to the dorsal root ganglion through the peripheral nerves that innervate it. VZV latency is most abundant in the first branch of the trigeminal ganglion and ganglia in the thoracic region.¹⁰ Antibodies specific to VZV were mentioned in various studies that their levels relatively did not decrease significantly with age. This proves that cell-mediated immunity plays a role in immunity against the occurrence of herpes zoster.¹¹

Neuropathic pain is pain caused by nerve damage. In contrast to acute pain, neuropathic pain is more difficult to manage. In neuropathic pain, there is abnormal processing of sensory input. As a result, pain arises spontaneously or in response to changes in the environment and is usually persistent and chronic. The pathophysiology of PHN involves abnormalities in the peripheral nervous system and the central nervous system. During an episode of acute herpes zoster, VZV that was previously dormant undergoes a process of reactivation, replication, and propagation along the infected nerves, triggering an inflammatory response from the body's immune system, which can then damage the peripheral and central nervous systems. The damage to the nervous system then triggers various molecular changes in the nervous system, which form the basis of the mechanism for the occurrence of PHN.¹⁵

PHN has a very diverse description of symptoms in each individual. This shows that many pathomechanisms occur in PHN conditions.^{10,14} Clinical complaints that are felt in these patients are a feeling of pain, a burning sensation in the skin, prickling, and sometimes a feeling like an electric shock which is a characteristic symptom of neuropathic pain. The patient also complained of aggravating pain if the skin was touched by the cloth, indicating that central sensitization had occurred in this patient. This complaint is felt to follow the path of the skin dermatome on the waist.

Based on the variety of symptoms it causes, there are three main mechanisms that explain the occurrence of PHN. The three mechanisms are peripheral sensitization, central sensitization, and deafferentiation. Peripheral sensitization and central sensitization are said to



be the main mechanisms underlying the clinical symptoms of hyperalgesia and allodynia experienced by the majority of patients with PHN. While clinical symptoms such as hypesthesia or anesthesia, with or without allodynia based on the mechanism of differentiation, are only found in a small proportion of PHN patients.¹⁴

The diagnosis of postherpetic neuralgia in this patient was established based on the anamnesis and physical examination obtained. Where the patient begins to complain of pain after the appearance of a vesicle on the skin filled with clear fluid. Pain persists after complaints of dry vesicles and also a change in skin color in the area of the former infection after healing has taken place. The diagnosis is also supported by an assessment of neuropathic pain using the S-LANSS score with a value of 16. The S-LANSS score is one of the pain assessment instruments used to differentiate neuropathic pain from non-neuropathic pain. The S-LANSS score is done by asking several questions that describe sensory abnormalities, and each question has a value with a total score of 24. If the score obtained is above 12 then the patient tends to lead to neuropathic pain.

Pulsed radiofrequency (PRF) is a minimally invasive technique that uses the pulsed high-voltage current (300-500 kHz) to target nerves. The current is carried for about 20ms in 1 pulse at about 45 volts and then followed by a 480 ms stationary phase to avoid thermal damage. This stationary phase is intended to allow heat dissipation and reduce exposure to surrounding organs. As a result, PRF is considered to have a lower complication rate. Recent studies have shown that there are beneficial effects of PRF use on postoperative pain, peripheral neuropathic pain, and postherpetic neuralgia.

The mechanism of radiofrequency that underlies PRF is the existence of an electric current around the tip of the needle. The change in current causes the movement of electric ions. The movement of ions causes friction which then results in changes in the nerves which are believed to interfere with the pain conduction system. Cells undergo nerve damage at 45°C, and at 60°C – 100°C, protein coagulation is induced, which causes cell death. During the PRF procedure, the needle tip is placed around the target nerve, then directed toward the nerve until the patient feels a tingling sensation and/or dysesthesia at a voltage of 0.2-0.5 volts. Tissue temperature was maintained below 42°C.

In this case report, the PRF procedure was performed on a patient using 270 Khz energy pressure. Current is delivered 20ms per beat with a temperature of 39°C-40°C with a voltage of 45 volts. The mechanism of PRF in overcoming pain is very complex. Previous studies have shown that the analgesia effect of PRF is related to pulsed current and biological effects. PRF



produces lesions that are selective in small primary sensory nociceptors such as C and A δ nerves rather than larger non-pain sensory such as nerves A β . PRF can stimulate DRG with intermittent pulsed current and block signal transduction. In addition, PRF can form a high voltage field which further inhibits the activity of glial cells, where these glial cells can release inflammatory mediators.

The mechanism of action of PRF is currently undergoing extensive research. At present, most studies show changes in synaptic transmission and in neuromodulatory effects.⁹ A popular theory is that the electro field changes rapidly because PRF alters the transmission of pain signals via pathways involving c-Fos. A popular theory is that the electro field changes rapidly because PRF alters the transmission of pain signals through pathways involving c-Fos. These results also indicate long-term inhibition of C nerve excitability.¹⁰

The mechanism of action of PRF is manifold and may involve changes in cellular structure, neuronal activation, and changes in gene expression (activation of the initial gene response then changes the expression of the activated gene is a transcription factor, so changes in gene expression occur in the long term, not limited to the early stages), a global reduction of evoked synaptic activation leads to reduced transmission of pain impulses through C and A δ nerves through long-term depression and changes in synaptic field strength and long-term potentiation. All these mechanisms have the potential to reduce the transmission of pain impulses.

Conclusion

The pulsed radiofrequency procedure in the dorsal root ganglion is a minimally invasive procedure that is effective and safe in treating postherpetic neuralgia pain. The use of imaging guidance in this procedure can improve the accuracy of needle tip placement and prevent the occurrence of side effects and complications.

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