

# Ultrasound-guided peri-brachial plexus polydeoxyribonucleotide injection for a patient with postherpetic brachial plexopathy

## A case report

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### Abstract

**Rationale:** Although most complications of herpes zoster (HZ) are associated with the spread of varicella-zoster virus from the initially involved sensory ganglion, motor nerve impairment, such as limb weakness, is a rare but severe complication that is difficult to treat.

**Patient concern:** A 73-year-old female presented with sudden left upper limb pain and weakness after HZ.

**Diagnosis:** Brachial plexopathy following HZ (postherpetic brachial plexopathy).

**Intervention:** Despite alleviation of the vesicles with antiviral treatments, the left upper limb weakness and neuropathic pain did not improve. After obtaining patient's consent, ultrasound-guided polydeoxyribonucleotide (PDRN) injection was performed around the left brachial plexus.

**Outcomes:** The patient showed marked improvement in left arm pain from numerical rating scale (NRS) 9 to 4, 1 day after PDRN injection. Subsequently, the pain improved to NRS 3, and motor weakness improved to Medical Research Council grade 2 to 4.

**Lessons:** PDRN can be considered a viable substitute for corticosteroid injection in treatment of motor weakness and neuropathic pain after HZ.

**Abbreviations:** HZ = herpes zoster, MRI = magnetic resonance imaging, NRS = numeric rating scale, PDRN = polydeoxyribonucleotide, VZV = varicella-zoster virus.

**Keywords:** brachial plexus, herpes zoster, polydeoxyribonucleotide, postherpetic neuralgia, ultrasonography

## 1. Introduction

Herpes zoster (HZ) usually results from reactivation of endogenous varicella-zoster virus (VZV) that persisted in latent

Editor: Eric Bush.

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT and Future Planning (NRF-2017R1D1A1B03033127) (NRF-2018R1C1B5085905).

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the authors or upon any organization with which the authors are associated.

The authors have no conflicts of interest to disclose.

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Medicine (2019) 98:31(e16694)

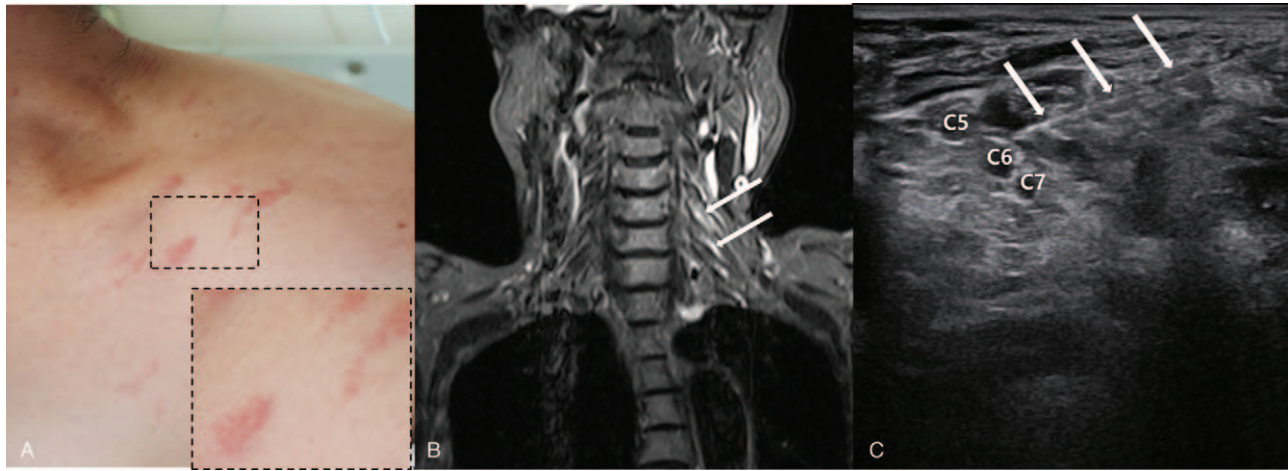
Received: 18 December 2018 / Received in final form: 15 April 2019 / Accepted: 29 April 2019

<http://dx.doi.org/10.1097/MD.00000000000016694>

form within the sensory ganglia.<sup>[1,2]</sup> Most complications of HZ are associated with the spread of VZV from the initially involved sensory ganglion.<sup>[1]</sup> However, motor nerve impairment after HZ, such as limb weakness, is a rare but burdensome complication that is difficult to treat. The corticosteroids have previously been reported to be effective in managing postherpetic motor and sensory neuropathies, owing to their anti-inflammatory effects.<sup>[3]</sup> However, its use may be limited because of various side effects, such as adrenal suppression, glucocorticoid-induced osteoporosis, and cognitive and mood disorders.<sup>[4]</sup> Recently, polydeoxyribonucleotide (PDRN) has been reported as a viable substitute for corticosteroids in various musculoskeletal disorders.<sup>[4–8]</sup> Here, we reported a case of a patient with brachial plexopathy following HZ (postherpetic brachial plexopathy), who showed improvement after administration of ultrasound-guided PDRN injection around the brachial plexus. This case report was approved by the institutional review board of Daegu Fatima Hospital (DFH17ORIO343). Informed written consent was obtained from the patient for publication of this case report and accompanying images.

## 2. Case report

A 73-year-old Asian female with a history of well-controlled hypertension and hyperlipidemia presented with sudden left upper limb pain, graded numeric rating scale<sup>[9]</sup> (NRS) 9, and weakness. This was preceded by paresthesia for 3 days in the left posterior neck and left arm. Magnetic resonance imaging (MRI) of the spine did not show any evidence of spinal disease. However, characteristic grouped vesicles and surrounding



**Figure 1.** (A) The erythematous vesicular eruption is distributed around the left shoulder. (B) Brachial plexus MRI acquired 21 days after the onset of symptoms. Coronal T2-weighted short tau inversion recovery images demonstrate mild swelling and increased signals in the left brachial plexus especially in the C5 and C6 dorsal root ganglia and roots (white arrow) (C) Ultrasound-guided PDRN injection (white arrow) to the left C5 and C6 root. MRI = magnetic resonance images, PDRN = polydeoxyribonucleotide.

erythema were developed on the dermatome of 5th and 6th cervical root, 3 days after development of the pain. There was a weakness in the left shoulder, which was rated Medical Research Council (MRC)<sup>[10]</sup> grade 2 in the manual muscle test (Fig. 1A). The remaining neurological examination was insignificant. With clinical identification of HZ, antiviral and pain control therapy was started with IV acyclovir (5 mg/kg/d), pregabalin (150 mg/d), and Helium-Neon laser (632.8 nm/8.5 mW, 10 min/d) for 8 days. Despite resolution of the vesicles and erythema, the weakness did not improve. In electrophysiological studies, performed 3 weeks after onset of symptoms, left brachial plexopathy was diagnosed. Brachial plexus MRI was acquired 21 days after the onset of symptoms. Coronal T2-weighted short tau inversion recovery images demonstrated mild swelling and increased signals in the left brachial plexus, especially in the C5 and C6 dorsal root ganglia and roots. With the result of studies and clinical history, postherpetic brachial plexopathy was diagnosed (Fig. 1B). Patient was initially treated with pregabalin (150 mg/d) and fentanyl patch (25 µg/h) for pain control, but these were discontinued due to the side effects, such as nausea and vomiting. The non-steroidal anti-inflammatory drugs were tried but also discontinued due to the side effect; heartburn. Next, the patient was recommended for corticosteroid injection around the brachial plexus, but she refused the injection due to concerns regarding the metabolic side effects of corticosteroids. Then, after she was adequately informed about the anti-inflammatory effects of PDRN, the patient agreed to receive a PDRN (Rejuvenex, Pharma Research, South Korea) injection. Ultrasound-guided injection was performed with PDRN (PDRN [5.625 mg/3 mL] + 1% lidocaine [7 mL], total: 10 mL) around the left brachial plexus (Fig. 1C). After single day, the patient showed marked alleviation of left arm pain from NRS 9 to 4. Three more PDRN injections were performed at a weekly interval. After the treatments, the left arm pain was maintained at NRS 3 for 6 months and motor weakness improved from MRC grade 2 to 4.

### 3. Discussion

The VZV usually invades sensory nerves; however, it can also invade motor nerves, especially the anterior spinal nerve root or

anterior horn cell. Invasion of the brachial plexus is also uncommon.<sup>[3]</sup> In previous studies, the motor neuropathy caused by HZ was suggested to be associated with an inflammatory demyelinating process.

PDRN is obtained from the sperm of salmon and acts via stimulation of the A<sub>2A</sub> receptor.<sup>[11]</sup> Adenosine is a purine nucleoside that is released from variety of cells in response to several types of stress.<sup>[12]</sup> It has previously been suggested that adenosine regulates inflammation via interaction with 1 or more of 4 known receptors (A<sub>1</sub>, A<sub>2A</sub>, A<sub>2B</sub>, and A<sub>3</sub>).<sup>[12]</sup> Among the receptors, stimulation of A<sub>2A</sub> receptor is known to inhibit production of pro-inflammatory cytokines, such as tumor necrosis factor-α, in human peripheral blood mononuclear cells. Moreover, in a previous study, PDRN was shown to decrease the circulating levels and cartilage expression of the inflammatory cytokines in an animal model of rheumatoid arthritis.<sup>[13]</sup> These results suggested that PDRN may potentially be a viable therapeutic alternative to corticosteroids. In our case, a patient with postherpetic motor and sensory neuropathies exhibited amelioration of her symptoms after ultrasound-guided peribrachial plexus PDRN injections. The neurological symptoms seem to have improved due to the anti-inflammatory effects of PDRN. Therefore, when the use of corticosteroids is restricted due to their side effects, PDRN can be considered.

Different studies have reported different prognosis of postherpetic brachial plexitis. Motor recovery varied from full recovery within a few days to partial recovery after 2 years.<sup>[1,3,14–16]</sup> Our patient did not gain full recovery, even after 6 months. This is thought to be due to the degree of motor nerve involvement. However, more studies are needed to reveal the exact prognosis of this disease.

In conclusion, PDRN injection can be considered a viable substitute of corticosteroid injection, when the use of corticosteroid is restricted due to side effects.

### Author contributions

**Supervision:** Jong-Moon Hwang, Jin-Sung Park, Sungwon Park, Byung Joo Lee.

**Writing – original draft:** Jun Young Kim, Donghwi Park.

**Writing – review and editing:** Donghwi Park.

## References

- [1] Fabian VA, Wood B, Crowley P, et al. Herpes zoster brachial plexus neuritis. *Clin Neuropathol* 1997;16:61–4.
- [2] Kim JM, Lee Z, Han S, et al. Treatment of Ramsay-Hunt's syndrome with multiple cranial nerve involvement and severe dysphagia: a case report. *Medicine* 2018;97:e0591.
- [3] Kim JG, Chung SG. Herpetic brachial plexopathy: application of brachial plexus magnetic resonance imaging and ultrasound-guided corticosteroid injection. *Am J Phys Med Rehabil* 2016;95:e67–71.
- [4] Park D, Yu KJ, Cho JY, et al. The effectiveness of 2 consecutive intra-articular polydeoxyribonucleotide injections compared with intra-articular triamcinolone for hemiplegic shoulder pain: a STROBE-complaint retrospective study. *Medicine* 2017;96:e8741.
- [5] Lee GJ, Park D. Usefulness of polydeoxyribonucleotide as an alternative to corticosteroids in patients with lateral epicondylitis: a case series. *Medicine* 2018;97:e10809.
- [6] Park JS, Park D. Effect of polydeoxyribonucleotide injection in a patient with carpal tunnel syndrome. *Am J Phys Med Rehabil* 2018;97:e93–5.
- [7] Park D. Application of ultrasound-guided C5 nerve root block using polydeoxyribonucleotide in traumatic C5 nerve root injury caused by fracture of the articular process of the cervical spine: a case report. *Medicine* 2017;96:e8728.
- [8] Ryu K, Ko D, Lim G, et al. Ultrasound-guided prolotherapy with polydeoxyribonucleotide for painful rotator cuff tendinopathy. *Pain Res Manag* 2018;2018:8286190.
- [9] Joos E, Peretz A, Beguin S, et al. Reliability and reproducibility of visual analogue scale and numeric rating scale for therapeutic evaluation of pain in rheumatic patients. *J Rheumatol* 1991;18:1269–70.
- [10] Park D, Lee SH, Shin JH, et al. Lower limb muscle magnetic resonance imaging in myotonic dystrophy type 1 correlates with the six-minute walk test and CTG repeats. *Neuromuscul Disord* 2018;28:29–37.
- [11] Bianchini P, Tellini N, Morani AM, et al. Pharmacological data on polydeoxyribonucleotide of human placenta. *Int J Tissue React* 1981;3:151–4.
- [12] Jacobson KA, Gao ZG. Adenosine receptors as therapeutic targets. *Nat Rev Drug Discov* 2006;5:247–64.
- [13] Bitto A, Polito F, Irrera N, et al. Polydeoxyribonucleotide reduces cytokine production and the severity of collagen-induced arthritis by stimulation of adenosine A<sub>2A</sub> receptor. *Arthritis Rheumat* 2011;63:3364–71.
- [14] Teo HK, Chawla M, Kaushik M. A rare complication of herpes zoster: segmental zoster paresis. *Case Rep Med* 2016;2016:7827140.
- [15] Choi JY, Kang CH, Kim BJ, et al. Brachial plexopathy following herpes zoster infection: two cases with MRI findings. *J Neurol Sci* 2009;285:224–6.
- [16] Jones LKJr, Reda H, Watson JC. Clinical, electrophysiologic, and imaging features of zoster-associated limb paresis. *Muscle Nerve* 2014;50:177–85.