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Case Report

Simultaneous herpes zoster rash in the femoral and medial buttock region that illustrates the innervation zone of the dorsal ramus of the lumbar spinal nerve root: A case report

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1. Introduction

Although low back pain (LBP) is one of the most common symptoms in daily orthopedic practice, its etiology is complex, with a wide variety of underlying causes, including lumbar muscle/fascial injury, lumbar facet syndrome, discogenic back pain, spinal instability, lumbar vertebral fracture, and neurogenic back pain [1,2]. Among them, pathological conditions of the lumbar dorsal ramus have recently been identified as a source of LBP. These conditions include degenerative posterior impingement involving supporting structures of the lumbar spine, soft-tissue dissection, or stripping during lumbar decompression surgery, resulting in lumbar dorsal ramus syndrome [2–4]. Similarly, entrapment neuropathy of the superior cluneal nerve (SCN) and middle cluneal nerve (MCN), which originate from the lateral branch of the lumbar dorsal ramus, are also known causes of LBP [5,6]. Regarding the upper posterior trunk, although the cause of pain in the neck or scapula associated with cervical radiculopathy is unclear, cervical dorsal ramus syndrome is suspected to be a source of neck and scapular

pain [7–9]. Therefore, to treat LBP due to mechanical pressure on the dorsal rami as well as neck/scapular pain, it is important to visually understand the precise innervation zones of the dorsal rami. Historically, dermatomes have been outlined using various anatomical techniques, such as contiguous tracing distally from the spinal nerve under a microscope to determine their peripheral distribution on the skin in cadavers, or finding the anesthetic area after rhizotomy in monkeys or human patients [10]. Additionally, a report from 1900 analyzed herpetic skin eruptions to outline dermatomes [11].

Previously, we reported a case of herpes zoster lesions occurring simultaneously in the upper extremity and interscapular region, likely extending from the C8 ganglion. This illustrated the zone innervated by the dorsal ramus of the cervical nerve root in AME case reports in 2021 [12]. In the current report, we present a similar case of herpes zoster rash occurring simultaneously in the femoral and medial buttock regions that illustrates the innervation zone of the dorsal ramus of the L3 spinal nerve.

2. Report of the case

A healthy 83-year-old woman presented to our clinic with right femoral neuralgia without any episodes. She had no major medical history, except for lumbar spinal stenosis with mild intermittent claudication on the right calf and buttock, and no immunodeficiency was noted. At the initial visit, she had no skin lesions on her right lower extremity. She had radiating pain in the medial and distal part of the thigh and buttock pain on the right side. We diagnosed her with femoral neuralgia associated with the lumbar spinal stenosis, and she was treated using 10 mg/day oral miragabalin besylate. One month later, she re-visited our clinic and complained of a blistering skin rash in the medial and distal parts of the femur and medial buttock on the right side, which she first noticed around 1 week after the first visit; she was then treated by a dermatologist who diagnosed the skin rash as herpes zoster and prescribed oral amprenavir for 7 days. The distribution of the herpes zoster rash appeared to extend from the medial area of the

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posterior superior iliac spine to the caudal lateral area in the back on the right side, and was mainly located in the medial and distal part of the thigh on the right side, which corresponds to the innervation area of the L3 spinal nerve (Fig. 1). She presented with mild postherpetic neuralgia of the right femur and continued 10 mg/day oral mirogabalin besylate for another month.

3. Discussion

The dorsal ramus is a branch of the lumbar spinal nerves. Anatomically, the spinal nerve splits into the dorsal and ventral rami almost immediately after exiting the intervertebral foramen. Then, the dorsal ramus passes dorsally and caudally, and divides into the medial and lateral branches, which contain sensory and motor fibers, to supply the muscles and skin of the posterior trunk [2,13]. Generally, the medial branch supplies the tissue from the midline to the facet joint line, and the lateral branch innervates the tissues lateral to the facet joint. Lateral branches of L1-3 (occasionally including L4, 5) lumbar dorsal rami and S1-3 form the SCN and MCN, respectively, and SCN and MCN innervate the upper lateral and medial surfaces of the buttock [14]. In the present case, lateral branch of the L3 lumbar dorsal ramus innervated the medial side of the upper surface of the buttock, which corresponds to the region where the herpes zoster rash appeared in the buttock. In addition, the rash region in the medial and distal part of the femur corresponds to the innervation area of the L3 nerve root, referred to a dermatome of international standards for neurological classification of spinal cord injury by the American Spinal Injury Association (Fig. 2, left) [15], and the dorsal ramus of the L3 spinal nerve (Fig. 2, right) [13]; therefore, the herpes zoster rash in the current case was proposed to be caused by varicella zoster virus (VZV) traveling from the same L3 ganglion on the right side. As mentioned in our previous case report, reactivated VZV in the spinal dorsal root ganglia typically travels from the individual dorsal root ganglia along the microtubules of the sensory axons to the skin, causing neurological pain followed by eruption of the rash [16,17]. The present case also showed the same phenomenon as our previous report, which visualizes the innervation zone of the dorsal ramus, despite the difference between the cervical and lumbar nerve roots. Based on several medical cases reported previously, the herpes zoster rash arising from the lumbar dorsal ganglion is not always accompanied by a rash on the posterior trunk, as it may depend on the severity of reactivation of VZV [18].

Regarding the history of the dermatomes, Herringham first reported the sensory distribution of segmental nerve fibers from the brachial plexus in 1886 through dissection of neonatal and adult cadavers [19]. Next, in 1893, Sherrington created a dermatome with normal sensation by severing the dorsal nerve roots in rhesus monkeys [20]. Sherrington compared the data with human skin innervation and found similarities in sensory distribution between monkeys and humans. In 1900, Head and Campbell studied 394 cases of VZV eruption (shingles) and created a dermatome map demonstrating the region of shingles caused by VZV infection in different samples of spinal ganglia [11]. However, most cases of shingles were originated from the upper cervical (a total of 36 cases originated from C3 and 4 dorsal root ganglion), thoracic (284 from T1-12), and proximal femur (49 from L1, 2) dorsal root ganglia, and the shingles on the upper/lower extremities were relatively few (10 from C5-8 and 8 from L3-5). Thus, the innervation zone of the dorsal ramus from the cervical/lumbar dorsal root ganglion was likely insufficient from their study. In 1948, Keegan and Garrett mapped hypoalgesia produced by anesthesia or compression from a herniated disc of a single nerve root, and demonstrated that linear dermatomes extend downward in each limb [21]. We suggest a broad survey of herpes zoster rash cases as an alternative method of

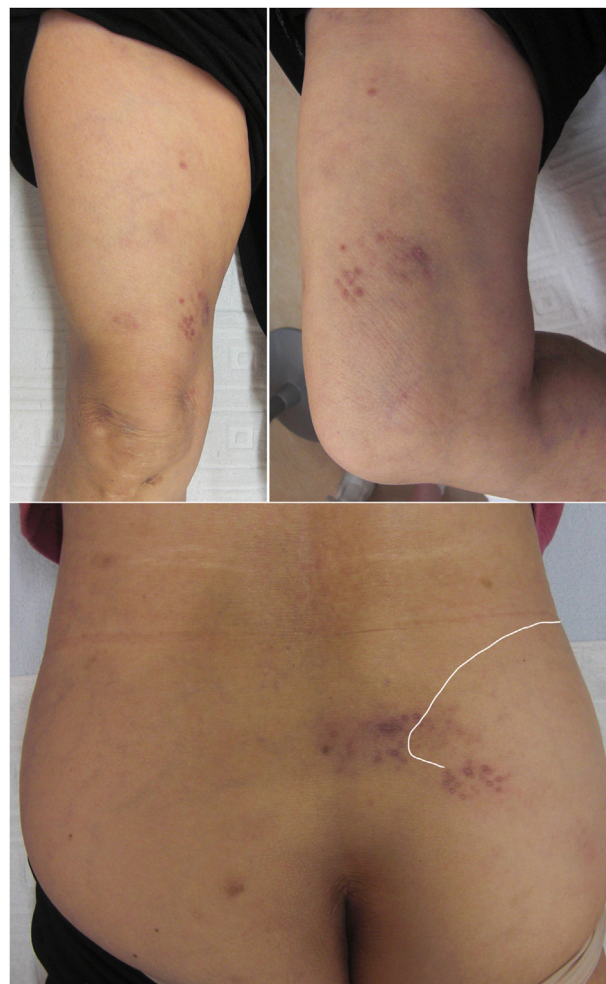


Fig. 1. An 83-year-old woman presented with a blistering skin rash in the medial and distal part of the femur (above), as well as the area from medial part of the posterior superior iliac spine to the caudal lateral part in the buttock (below) on the right side. A white line outlines an edge of the iliac cleft.

creating a precise dermatome of the dorsal ramus. This system will enable clinicians to distinguish the innervation areas of the lateral and dorsal branches of the dorsal rami and identify the overlapping adjacent dermatomes by examining many patients with herpes zoster whose symptoms are similar to those of the present patient.

Since neurological pain with herpes zoster precedes the appearance of a skin rash by several days to a week, it is difficult to diagnose it correctly in the initial phase. In the present case, we first suspected femoral neuralgia because of the temporal worsening of intermittent claudication with lumbar spinal stenosis, although the femoral area of radiating pain caused by herpes zoster was different from the area of the regular pain. In the initial phase of herpes zoster, several diseases may be suspected as alternative diagnoses, including lumbar disc herniation [22], lumbar spinal stenosis [18] or malignant lymphoma [23]. For example, Koda et al. reported a patient with herpes zoster sciatica who had been first diagnosed with lumbar spinal stenosis and was intended to undergo surgical treatment, until a skin rash was detected [18]. It is also important to observe that herpes zoster virus reactivation can produce chronic radicular pain without eruption of the rash, which is called zoster sine herpette (ZSH). Patients with ZSH are reported to suffer more serious pain compared with patients with herpes zoster [24,25]. Diagnosis of ZSH or herpes zoster in the initial phase requires

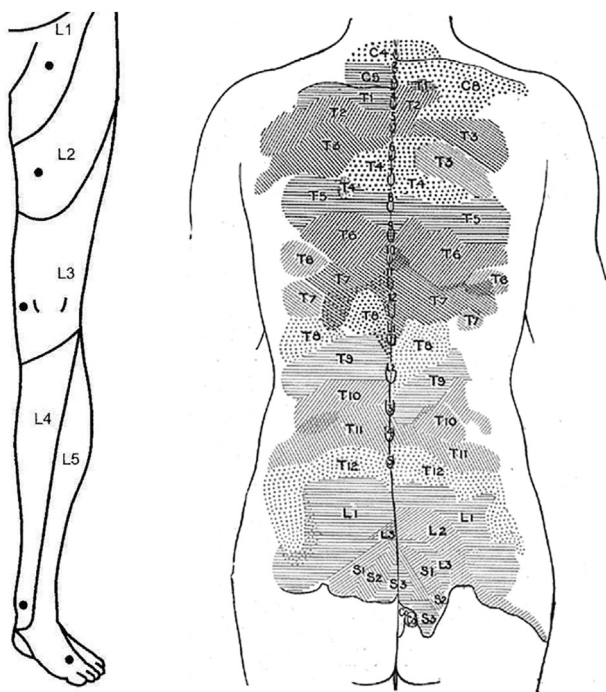


Fig. 2. Dermatome of the lower extremity cited from international standards for neurological classification of spinal cord injury by the American Spinal Injury Association (*left*) and dermatome of dorsal rami cited from *Anatomy of the Human Body* originally written by Henry Gray (*right*).

detection of active VZV IgM antibody in the serum or cerebrospinal fluid (CSF), or anti-VZV IgG antibody in the CSF, or the detection of VZV DNA in blood mononuclear cells or the CSF [24].

In conclusion, a case of herpes zoster with simultaneous skin rash in the femoral and medial buttock regions was reported. The medial buttock region illustrated by the herpes zoster rash corresponded to the innervation zone of the dorsal ramus of the L3 lumbar spinal nerve root. We suggest that simultaneous herpes zoster rash is useful for visualizing detailed innervation of the dorsal ramus from the lumbar spinal nerves.

Consent section

The patient and/or her family were informed that data and photographs from the case would be submitted for publication and gave their consent.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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