The characteristic clinical symptoms of C-4 radiculopathy caused by ossification of the posterior longitudinal ligament

Case report

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Cervical radiculopathy of the C2–4 spinal nerves is a rare condition and is poorly documented in terms of clinical symptoms, hindering its detection during initial patient screening based on imaging diagnostics. The authors describe in detail the clinical symptoms and successful surgical treatment of a patient diagnosed with isolated C-4 radiculopathy. This 41-year-old man suffered from sleep disturbance because of pain behind the right ear, along the right clavicle, and at the back of his neck on the right side. The Jackson and Spurling tests were positive, with pain radiating to the area behind the patient’s ear. Unlike in cases of radiculopathy involving the C5–8 spinal nerves, no loss of upper-extremity motor function was seen. Magnetic resonance imaging showed foraminal stenosis at the C3–4 level on the right side, and multiplanar reconstruction CT revealed a beak-type ossification of the posterior longitudinal ligament in the foraminal region at the same level. In the absence of intracranial lesions or spinal cord compressive lesions, the positive Jackson and Spurling tests and the C3–4 foraminal stenosis were indicative of isolated C-4 radiculopathy. Microscopic foraminotomy was performed at the C3–4 vertebral level and the ossified lesion was resected. The patient’s symptoms completely resolved immediately after surgery. To the authors’ knowledge, this report is the first to describe the symptomatic features of isolated C-4 radiculopathy, in a case in which the diagnosis has been confirmed by both radiological findings and surgical outcome. Based on this case study, the authors conclude that the characteristic symptoms of C-4 radiculopathy are the presence of pain behind the ear and in the clavicular region in the absence of upper-limb involvement. (http://thejns.org/doi/abs/10.3171/2014.2.SPINE13500)

Key Words • cervical spine • C-4 radiculopathy • foraminal stenosis • ossification of posterior longitudinal ligament

Abbreviation used in this paper: OPLL = ossification of the posterior longitudinal ligament.
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ligament (OPLL) and describe the characteristic clinical symptoms and pathology of C-4 radiculopathy.

Case Report

History and Presentation. This 41-year-old man had been suffering from pain behind the right ear, along the right clavicle, and at the back of his neck on the right side for 6 months (Fig. 1A–C). He had been unable to sleep well, particularly due to severe pain behind his right ear. The symptoms had continued to worsen gradually. Because no evidence of an intracranial lesion was found by the neurosurgeon, the patient was referred to the Niigata Central Hospital for additional evaluation. The Jackson neck compression test (the clinician places the neck into extension and then presses straight down on the head) and Spurling neck compression test (the clinician flexes the neck toward the involved side and then presses straight down on the patient’s head) were positive, with radiating pain to the area behind the right ear. Examination of the upper and lower limbs revealed that all deep tendon reflexes were absent, with the exception of the bilateral brachioradialis tendon reflexes. No motor weakness was observed in the upper body, including the trapezius muscle. The patient had neither myelopathic symptoms (loss of manual dexterity or gait disturbance) nor respiratory dysfunction.

Imaging. A preoperative chest radiograph showed no evidence of phrenic nerve palsy; T2-weighted MRI showed foraminal stenosis at the C3–4 level on the right side, but no central canal compressive lesions of the cervical cord (Fig. 2A–E). Multiplanar reconstruction CT showed a beak-type OPLL in the foraminal region at the C3–4 level, as well as a spontaneous fusion between the C-2 and C-3 vertebrae (Fig. 3). Since no neural tissue compressive lesions were found in the spinal canal or foraminal regions, with the exception of C3–4 foraminal stenosis on the right side, the patient was diagnosed with isolated C-4 radiculopathy on the basis of the radiological and neurological findings.

Operation. Since the patient’s symptoms had not diminished through a 6-month course of conservative treatment, including various antiinflammatory medications, thermotherapy, cervical traction therapy, and trigger-point injections, decompression surgery of the C-4 nerve root was undertaken. The surgery was performed through a posterior approach. A C3–4 microscopic foraminotomy was performed using a high-speed drill with a diamond bur (2-mm diameter) and a sharp microcurette. Both the C-3 inferior and C-4 superior articular processes were partially removed to the extent that a microball tip (1 mm) could be easily inserted around the C-4 nerve root. Since the tension on the C-4 nerve root was still high due to the sharply protruding OPLL after posterior foraminotomy (Fig. 4 left), the intraforaminal portion of the OPLL was totally removed using a high-speed drill, while the C-4 nerve root was carefully retracted caudally (Fig. 4 right). After checking that the tension on the C-4 nerve root was sufficiently reduced, we completed the decompressive procedure without manipulation of the intraspinal canal region.

Postoperative Course. The patient’s postoperative course was uneventful, and his symptoms completely resolved immediately after surgery. Postoperative CT showed sufficient decompression of the intervertebral foramen and removal of the OPLL at the C3–4 level (Fig. 5). The patient had no neck symptoms, no obvious instability at the C3–4 level on flexion-extension radiographs, and no disability in his daily life at 2 years postoperatively.

Discussion

The pathology of C-4 radiculopathy is ambiguous because impairment of the C-4 nerve root at the C3–4 foraminal region is an extremely rare condition resulting from the process of disc herniation or degenerating spondylosis. Diagnosing C-4 radiculopathy is not easy due to the lack of upper limb involvement. Furthermore, the clinical features of C-4 radiculopathy have not been clear because only a few cases have been reported,4,6,9 and none of the studies have described characteristic clinical symptoms.

In the present report, the patient experienced sharp
pain behind his right ear and pain in the clavicular region as well as in his neck. However, sensory disturbance and loss of motor function in the upper limbs, which are typical for C5–8 radiculopathy, were not observed. We did not attempt a C-4 root block since, in the absence of intracranial lesions and spinal cord compressive lesions, the positive Jackson and Spurling tests and the C3–4 foraminal stenosis were indicative of isolated C-4 radiculopathy. Furthermore, the patient’s symptoms disappeared immediately after C3–4 foraminotomy without manipulation of the cervical canal, supporting the diagnosis of C-4 radiculopathy. Although the possibilities of cervical zygapophyseal joint pain and discogenic pain could be considered as potential causes of the neck symptoms in the present case, we performed only decompression of the C-4 nerve root without stabilization at the C3–4 segment. The success of this treatment in resolving the patient’s symptoms supports the diagnosis of C-4 radiculopathy. Other pathological conditions are associated with OPLL, namely diffuse idiopathic skeletal hyperostosis, ankylosing spondylitis, and other forms of spondyloarthropathies. However, these patients usually suffer from myelopathy, which was not the case in our patient.

Although 40%–80% of patients with radicular pain respond well to conservative treatment, persistent radicular pain after conservative treatment and progressive or profound motor weakness indicate the need for surgery. The effectiveness of posterior foraminotomy for cervical radiculopathy is reported to be 82.1%–86.4%. The advantages of posterior foraminotomy include the avoidance of complications associated with anterior approaches to the cervical spine and the lack of need for cervical fusion. In the current case, posterior fo-
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raminotomy with resection of the ossified lesion resolved the patient’s radicular pain (for 2 years as of this writing) without postoperative complications.

Here, we reported a case of C-4 radiculopathy lacking myelopathic symptoms and caused by C3–4 foraminal stenosis with a beak-type OPLL. Based on the present case, the characteristic symptoms of C-4 radiculopathy are the pain behind the auricle, neck pain radiating to the clavicular region, and positive Jackson and/or Spurling tests. A limitation of this report was that it described only a single case; hence, these findings might not be generally applicable to patients with C-4 radiculopathy, as a group. However, to our knowledge, this is the first report to indicate the characteristic symptomatic features of C-4 radiculopathy as strictly diagnosed by radiological findings, with confirmation of the diagnosis by the surgical outcome. Therefore, we believe that this report can help guide other clinicians faced with a similar problem. For patients who complain of these symptoms, an evaluation of C3–4 foraminal stenosis through radiological findings is important. Furthermore, it is desirable to consider posterior decompression surgery for patients unresponsive to conservative treatment.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author contributions to the study and manuscript preparation include the following. Conception and design: Katsumi. Acquisition of data: Katsumi. Analysis and interpretation of data: Katsumi. Drafting the article: Katsumi. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Katsumi. Administrative/technical/material support: Yamazaki, Watanabe, Hirano, Ohashi, Endo. Study supervision: Yamazaki, Watanabe, Hirano, Ohashi, Endo.

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