Leprotic cervical spondylodiscitis

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Abstract Leprosy is a chronic infectious disease caused by the *Mycobacterium leprae* that leads to leprotic neuropathy involving the peripheral nerve and several characteristic skin lesions. Skeletal involvement can occur in peripheral joints, such as the wrist and the ankle. However, there is no report of an axial leprotic lesion involving the spine or paraspinal soft tissue. The authors report the first case of a leprotic cervical lesion involving the axial skeletal system. A 48-year-old male presented with neck pain and severe pain in the right suprascapular area and left arm. Preoperative MRI of the cervical spine revealed signal changes in the prevertebral soft tissue at the level of the C3, 4, 5 vertebral bodies. There were a lower signal intensity on T1-weighted image and high signal intensity on T2WI of the bone marrow at the level of the C5 and C6 vertebral bodies, and a C5/6 segmental ossification of the posterior longitudinal ligament. There were herniated cervical disc on the left C5/6 with C6 root and the right side of C6/7 with a C7 root compression. He was previously diagnosed with leprosy when he was 14 years old and received treatment intermittently over the course of 7 years. But patient did not disclose his past history. Surgical intervention was

conducted using an anterior cervical approach. An incision was made in the anterior longitudinal ligament at C5/6, and a pinkish gray friable gelatinous material was observed on the C5/6 disc and on the anterior lower one-third surface of the C5 vertebral body. Specimens were obtained and subjected to pathological evaluation and microbiological culture. After C5/6 and C6/7 discectomies, nerve root decompression and autologous iliac bone grafting were performed at the C5/6 and C6/7 levels. The C5–6–7 vertebrae were fixed with an Atlantis[®] cervical locking plate and a screw system. The pathological report indicated chronic inflammation with heavy plasma cell infiltration on the specimen. We sent the specimens to the Institute of Hansen's Disease, and polymerase chain reaction for leprosy tested positive. After surgery, his pain disappeared and he was given a prescription for antileprotic drugs. The authors describe the first case of leprotic cervical spondylodiscitis that was operatively treated in a 48-year-old patient with known leprosy history since his 14 years old.

Keywords Leprosy · Cervical spine · Spondylodiscitis · Cervical disc herniation

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Introduction

Leprosy is a chronic infectious disease caused by the *Mycobacterium leprae* (*M. leprae*), that leads to leprotic neuropathy involving the peripheral nerve and several characteristic skin lesions [11]. Skeletal involvement can occur in peripheral joints, such as the wrist and the ankle [7]. However, there is no report of an axial leprotic lesion involving the spine or paraspinal soft tissue. The authors report the first case of a leprotic cervical lesion involving the axial skeletal system.

Case reports

A 48-year-old male presented with neck pain and severe pain in the right suprascapular area and left arm. Physical examination revealed any other clinical signs of leprosy such as skin lesions or areas of skin anesthesia. Preoperative magnetic resonance imaging (MRI) of the cervical spine revealed signal changes in the prevertebral soft tissue at the level of the C3, 4, 5 vertebral bodies. There were a lower signal intensity on T1-weighted image (T1WI) and high signal intensity on T2WI of the bone marrow at the level of the C5 and C6 vertebral bodies, and a C5/6 segmental ossification of the posterior longitudinal ligament (OPLL). There were herniated cervical disc on the left C5/6 with C6 root and the right side of C6/7 with a C7 root compression (Figs. 1, 2). Electromyogram suggested the findings of left C6 and right C7 radiculopathy. Preoperative laboratory investigation revealed moderately increased serum erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) level (each level was 34 mm/h and 1.1 mg/dl).

Surgical intervention was conducted using an anterior cervical approach. An incision was made in the anterior longitudinal ligament (ALL) at C5/6, and a pinkish gray friable gelatinous material without abscess was observed on the C5/6 disc and on the anterior lower one-third surface of the C5 vertebral body. Specimens were obtained and subjected to pathological evaluation and microbiological culture. After C5/6 and C6/7 discectomies, nerve root decompression and autologous iliac bone grafting were performed at the C5/6 and C6/7 levels. The C5–6–7

vertebrae were fixed with an Atlantis[®] cervical locking plate and a screw system (Fig. 3).

During the postoperative follow-up period, we confirmed that the results of culture were negative. The levels of ESR and CRP on postoperative third day were 6 mm/h and 1.2 mg/dl. However, the pathological report indicated chronic inflammation with heavy plasma cell infiltration on the specimen (Fig. 4). The authors tested polymerase chain reaction (PCR) for mycobacterium to rule out tuberculosis infection, but the result was negative. On postoperative interview with patient, he confessed to treat leprosy in his teenage. So we sent the specimens to the Institute of Hansen's Disease. The PCR for leprosy tested positive (Fig. 5). After surgery, his pain disappeared and he was given a prescription for antileprotic drugs. The antileprotic protocol was used for 6 months with the regimen of clofazimine, dapsone, and rifampicin, which was recommended by World Health Organization. At the 7-year follow-up, the patient remained asymptomatic and the cervical instrument appeared to be stable. The level of ESR and CRP were not elevated (11 mm/h and 1.24 mg/dl) and there were no significant abnormal findings on 7-year follow-up CT and MRI.

Discussion

The global prevalence of leprosy in 1999 was estimated to be approximately 1.4 per 10,000 population, with 731,369 cases of leprosy being registered for treatment in 82 countries. The majority of the global leprosy burden is

Fig. 1 Preoperative cervical spine magnetic resonance sagittal imaging showing a isosignal intensity on T1WI and high signal intensity on T2WI of the prevertebral soft tissue at the level of the C3, 4, 5 vertebral bodies. There were a lower signal intensity on T1WI and high signal intensity on T2WI of the bone marrow at the level of

the C5 and C6 vertebral bodies, and a C5/6 segmental ossification of the posterior longitudinal ligament. There were herniated cervical disc on the level of C5/6 and 6/7 vertebrae with C6, 7 root compression

Fig. 2 Preoperative magnetic resonance imaging T1 and T2WI axial views revealing a herniated cervical disc on the left C5/6 and the right C6/7 vertebrae with a C6, 7 root compression. Prevertebral soft tissue swelling which showed in sagittal view at the level of C2/3, 3/4, 4/5 was not definite in axial view of C5/6 and C6/7

Fig. 3 Postoperative radiologic study of cervical spine (**a** immediate postoperative X-ray, **b** there was good cervical bone fusion on 7-year follow-up cervical CT, **c** there was no abnormal signal intensity at prevertebral space on 7-year follow-up MRI)

concentrated in the intertropical belt where leprosy remains a public health problem in 24 countries, of which 11 endemic countries represent 90% of the cases reported worldwide [6].

In South Korea, the prevalence rate is 0.15 per 10,000 population, and new patients are discovered at a rate of 0.04 per 100,000 [2]. Although dapsone has been the treatment of choice for leprosy patients in Korea since

Fig. 4 Histologic sections of fibrocartilaginous tissue showing trabeculae and plasma cells infiltration (arrowheads) [a (H&E) $\times 40$] and chronic inflammation with heavy plasma cells infiltration (arrowheads) (b H&E $\times 400$)

Fig. 5 Polymerase chain reaction for leprosy tested positive. Amplification of *Mycobacterium leprae*-specific 65 kDa gene region from surgical specimen. Lane 1, *Mycobacterium leprae* Thai 53; lane 2, *Mycobacterium tuberculosis* strain; lane 3, surgical specimen 1; lane 4, surgical specimen 2; lane 5, DNA marker

1953, patients with leprosy were kept in an institution on Sorok island of Goheung-gun, where for isolation of leprosy patients and their families, in the 1970s. In the 1980s, the introduction of the World Health Organization multiple drug therapy (MDT) regimen of clofazimine, dapsone, and rifampicin had led to effective drug therapy, which had enabled leprosy patients to live scattered in hundred small groups in whole country [1, 2].

Our patient concealed the fact that he had been previously diagnosed with leprosy and did not receive regular and adequate MDT. He was previously diagnosed with leprosy when he was 14 years old and received treatment intermittently over the course of 7 years. The authors were not aware of this past history, thus the differential diagnoses for unusual prevertebral lesion included retropharyngeal cellulitis or abscess (unknown origin), longus colli tendinitis, ALL swelling, liquefied hematoma, and abnormal cyst (fluid collection) [3]. Because none of the differential diagnoses were contraindication for cervical surgery of radiculopathy and because the patient's radiating pain symptoms were definitely correlated with cervical disc herniation, the surgical plan included anterior cervical approach. The authors did not put more significant meaning about prevertebral signal change than cervical disc herniation, and we decided the operation with the idea of check

them all (disc herniation and prevertebral lesion) at once. But it is very important to believe that in any suspicious infections or prevertebral collection looking like a biopsy should be done before the surgical treatment. We regret having done such a mistake, and we think that no matter if the final result is the same but for protocol it should be done. The authors followed up the patient with cervical CT and MRI on 7 years after operation, because we anxious for recur of cervical inflammatory disease (leprosy). In cervical CT, there were good cervical bone fusions and no pseudoarthrosis.

The authors initially tested specimen for mycobacterium in 2002 and got result positive (18 kDa). But new criteria of identification for *M. leprae* changed (65 kDa). So we re-tested paraffin-embedded specimen. The result of retest was positive, and detail procedures are as follows.

First procedure was identification of Mycobacterial species from surgical specimen. The live *M. leprae* as positive control was isolated from foot-pads of *M. leprae*-infected BALB/c nude mouse. To analyze mycobacterial species from surgical specimen, we used the formalin-fixed and paraffin-embedded specimen. Except for deparaffinization of the specimen, procedures for DNA extraction were the following steps: (1) we added cell lysis buffer containing proteinase K (2 mg/μl), Tris-HCl (80 mM), and Tween-20 (0.5%) into pellet of *M. leprae* and small pieces of specimen. (2) The mixtures were incubated at 60°C for 18 h, and proteinase K was inactivated at 95°C for 10 min. (3) The crude DNA was purified using Multiple Elution Kit (Bio-Solution Co., Seoul, Korea) and then used as PCR templates. Second procedure was PCR of *M. leprae*-specific 65 kDa region. For amplification of specific region of 65 kDa gene (386 base pairs) of *M. leprae*, we used PCR primers as previously reported [4]. DNA amplification was performed using PTC-200 (MJ Research), and PCR condition consists of pre-denaturation step (95°C for 5 min), amplification step (denaturation step 95°C, 45 s; annealing step 62°C, 45 s; extension step 72°C, 90 s). For following 39 cycles, samples were maintained 72°C for 10 min. The samples were loaded onto 2% agarose gel to analyze

reaction products. The 65 kDa protein antigen is one of the major immunologically relevant proteins in various medically important mycobacteria, including *M. leprae*, *M. tuberculosis*, and *M. bovis* BCG [10]. In terms of strategies for treatment and the epidemiological implication, the rapid detection of causative mycobacteria is important [8]. The researchers developed PCR method using 65-kDa specific primer of *M. leprae* to discriminate from other mycobacteria in clinical specimens and demonstrated the only specificity of *M. leprae*, not other mycobacteria strains, including *M. tuberculosis*, *M. bovis* BCG, and *M. terrae* [4]. To discriminate the *M. leprae* from related mycobacterial species, we use oligonucleotides to amplify 65 kDa gene of *M. leprae* using PCR. We show result that 65-kDa specific region of *M. leprae*, but not *M. tuberculosis*, was detected from surgical specimen (Fig. 5). This result indicates that the patient has infected with *M. leprae*.

According to literatures on spondylodiscitis, there are differences of MR findings by infectious pathogen. In bacterial infection, it cause to widespread osteomyelitis of the disc, vertebrae, facets, and epidural spaces, and the vast majority of spinal infections involve both the disc and adjacent vertebral bodies [5]. Deep fungal infections have widely varying manifestations, and their diagnosis requires a high degree of suspicion. And even when a bacterial infection is identified, there may be a concomitant fungal infection [9]. So most cases represent more widespread and multiple sites than bacterial infection. But mycobacterium infection, such as tuberculosis and leprosy, is like to involve soft tissues, but not disc. So authors speculate that there was a leprotic infection on the ALL of cervical spine, which caused adjacent spreading to cervical vertebrae and disc in author's case.

We encountered an unexpected case of a leprotic lesion involving the cervical spine confirmed by pathologic testing. Even if the patient conceals his past histories, the physician must interview repeatedly when there are some doubts. Although leprosy leads to leprotic neuropathy involving the peripheral nerves and several characteristic skin lesions, the possibility of leprotic spondylodiscitis should be considered in patients with leprosy.

Conclusion

The authors describe the first case of leprotic cervical spondylodiscitis that was operatively treated in a 48-year-old patient with known leprosy history since his 14 years old.

Conflict of interest statement None of the authors has any potential conflict of interest.

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