Infected Charcot Spine Arthropathy Following Spinal Cord Injury

Kiyoshi Tarukado and Shuhei Ueda

Department of Orthopaedic Surgery, Kyushu Rosai Hospital, Japan Organization of Occupational Health and Safety, Fukuoka, Japan

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Infected Charcot spine arthropathy (ICSA) is a very rare condition[1-5]. Here, we describe a case of a successful ICSA treatment with one-stage surgery accompanied by thorough debridement and posterior instrumentation with a four-rod construct.

A 72-year-old man who had a spinal cord injury (SCI) 45 years ago visited our hospital. Although he was diagnosed with pyogenic spondylitis and treated for one year, there was no improvement. He finally presented to our department with a mass in the lower back, poor sitting balance, and fatigue.

Physical examination at the first visit revealed complete tetraplegia below the C6 level. He had a softball-sized, soft, and slightly reddish mass in the lower back (Fig. 1). *Pseudomonas aeruginosa* was detected in the puncture fluid culture tests. Furthermore, the laboratory evaluation revealed leukocytosis with a left shift (12500 /μL), elevated erythrocyte sedimentation rate (120 mm/h), and C-reactive protein (20 mg/dL). The tuberculosis, fungus, and syphilis tests provided negative results. The marked dislocation was observed on the sitting-supine X-ray (Fig. 2-A, B). Computed tomography (CT) revealed three columns of bone resorption centered on the L3-L4 intervertebral disc (Fig. 2-C, D). Magnetic resonance imaging (MRI) revealed a low- and high-intensity area in T1- and T2-weighted sagittal images that continued from the L3-L4 intervertebral disc to the posterior mass (Fig. 2-E, F). MRI also demonstrated that the cauda equina was discontinuous at the L3-L4 level. The patient was diagnosed with ICSA at L3-L4. Since the cauda equina amputation was recognized at the L3-L4 level on the MRI, it was judged that it would be easy to approach from the posterior to the vertebral body. Although the anterior-posterior combined approach is also an option, we chose a single posterior approach. Regarding the fixation area, we decided to perform a long fixation (T11-ilium) due to the need for excision of the two vertebral bodies, the substantial original instability, and the indispensable stability for alleviating the infection.

Surgery was performed through a posterior incision and posterior stabilization from the T11-ilium to correct the spinal alignment and stabilize the infection foci. The cauda equina was completely torn at the L3-L4 level, and no cerebrospinal fluid leakage was observed. The cauda equina and nerve roots below L3 existed in scars, making them difficult to identify. The cauda equina was ligated and cut off at the lower endplate level of the L2 vertebral body to ensure the field of view of the vertebral body. After performing the procedure, it was possible to reach the vertebral body from completely behind through the midline. Since it was possible to approach from the middle, no treatment of the nerve roots was necessary. Posterior vertebral column resection (L3 and L4), anterior column reconstruction (L2-L5) using titanium mesh cage filled with the ilium, and concomitant sufficient scar and contaminated tissue debridement were performed. The surgery was completed using additional posterior instrumentation, with a four-rod construct. The patient received intravenous antibiotics (CPFX) for four weeks, according to his culture results, followed by oral antibiotics (LVFX) for six more weeks.

The infection control and bone fusion were obtained without any implant problems during two years of follow-up (Fig. 3). He had bladder bowel dysfunction preoperatively. Though the cauda equina was ligated and cut off during the operation, the postoperative bladder and bowel dysfunction did not change. However, a new activity of daily life disorder has appeared in which the transfer is not self-sustaining,

Corresponding author: Kiyoshi Tarukado, kt99059@hotmail.com
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Figure 1. A softball-sized, soft, and slightly reddish mass was observed in the lower back. The heat of the mass was not so strong.

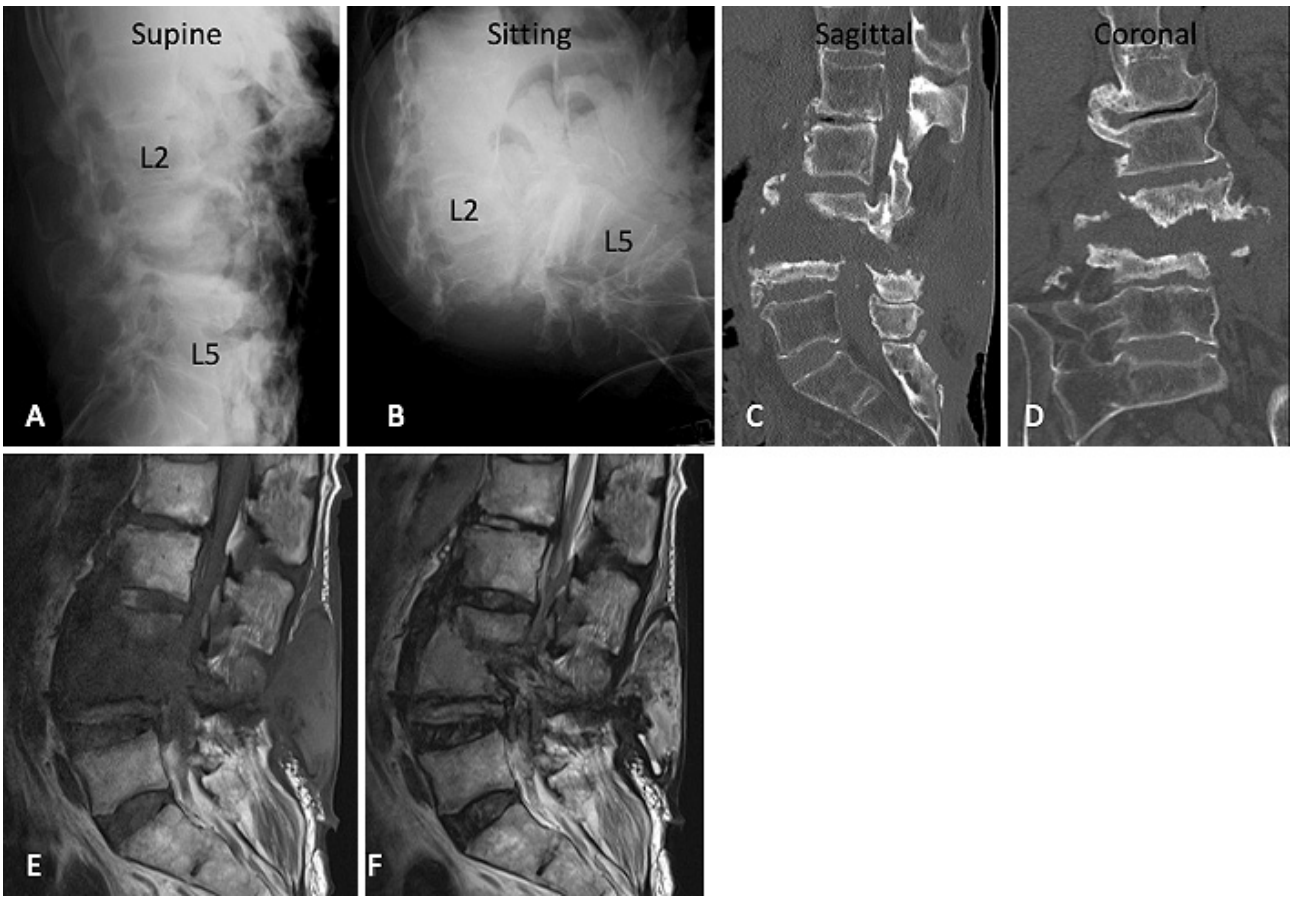

Figure 2. A, B. Significant instability was seen on the X-ray. C, D. Bone destruction accompanied by osteosclerosis of the vertebral body was observed in L3-L4 on CT. E, F. Low- and high-intensity area in T1- and T2-weighted sagittal images that continued from the L3-L4 intervertebral disc to the posterior mass was seen on MRI.

due to the reduced mobility of the spinal column.

Charcot spine arthropathy (CSA) is more commonly observed after traumatic spinal cord injury, though initially described as a complication of syphilitic infection[1,6,7]. Neurotraumatic and neurovascular theories have been reported regarding the cause of CSA, leading to progressive destructions, malalignment of the vertebral column, and intervertebral fluid collection[8]. CSA patients are more likely to face pressure ulcers, fistulas, and urinary tract infections[3,9], and the probability of having an infection in the destructive intervertebral space is 14%-17%[5,6]. The metallic implant placement at the infected site is usually avoided. However, debridement with antibiotics alone is not the best treatment for ICSA. Consequently, it is absolutely essential to create a stable environment, both to stop the destructive process and to control the infection in ICSA[4,5]. In the past, a two-stage

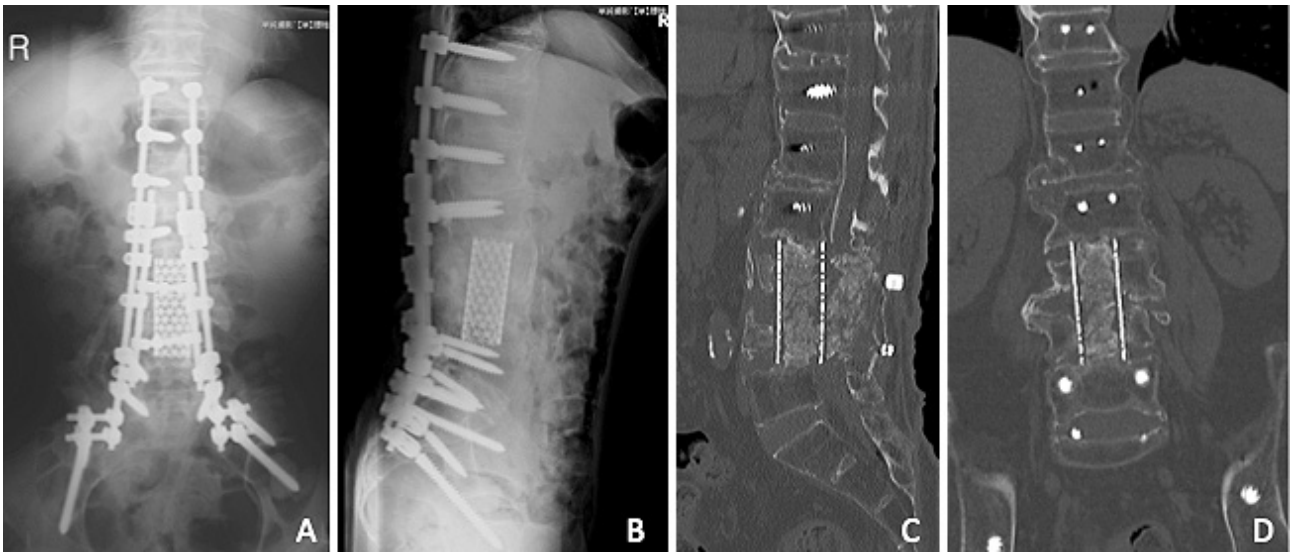

Figure 3. A, B. No implant failures are seen on the X-ray. C, D. Solid bone union is achieved without loosening of screws.

surgery, employing external fixation or using antibiotic-containing polymethyl methacrylate, and bone morphogenetic protein combined surgery have been reported[2,3,5,10]. Jacobs et al.[5] reported that the use of a four-rod construct with lumbopelvic surgery dramatically represents a substantial improvement in CSA treatment. Although the usefulness of metallic implants in spinal infection is controversial, there are several reports on the effectiveness of metallic implant use for spinal infection[11-13]. In this case, although the long fusion with the four-rod has a large amount of metal, we decided to use screws for the vertebral body (with no signal change) and the four-rods construct to obtain strong stabilization. We also performed a thorough debridement and used a mesh cage for anterior reconstruction to reduce the maximum amount of metal. Consequently, the two goals of spinal reconstruction and infection calming were achieved by performing aggressive debridement and strong fixation surgery with a four-rod construct in one-stage.

Despite the hesitation to place a metallic implant in the infected site, it seems to be an essential item in the treatment of ICSA. Strong fixation with a four-rod construct and one-stage surgery with a thorough debridement might be one of the useful treatment options for ICSA. However, it should also be noted that the loss of spinal mobility is a major problem for patients with SCI.

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References

1. Karthik Yelamarthy PK, Rustagi T, Mahajan R, et al. Infected charcot spine arthropathy. Spinal Cord Ser Cases. 2018;4(1):73.
2. Suda Y, Saito M, Shioda M, et al. Infected charcot spine. Spinal Cord. 2005;43(4):256.
3. Von Glinski A, Frieler S, Elia CJ, et al. Surgical management of charcot spinal arthropathy in the face of possible infection. Int J Spine Surg. 2021;15(4):752-62.
4. Aebli N, Pozel T, Krebs J. Characteristics and surgical management of neuropathic (Charcot) spinal arthropathy after spinal cord injury. Spine J. 2014;14(6):884-91.
5. Jacobs WB, Bransford RJ, Bellabarba C, et al. Surgical management of Charcot spinal arthropathy: a single-center retrospective series highlighting the evolution of management. J Neurosurg Spine. 2012;17(5):422-31.
6. Barrey C, Massourides H, Cotton F, et al. Charcot spine: two new case reports and a systematic review of 109 clinical cases from the literature. Ann Phys Rehabil Med. 2010;53(3):200-20.
7. Moreau S, Lonjon G, Jameson R, et al. Do all charcot spine require surgery? Orthop Traumatol Surg Res. 2014;100(7):779-84.
8. Ledbetter LN, Salzman KL, Sanders RK, et al. Spinal neuroarthropathy: pathophysiology, clinical and imaging features, and differential diagnosis. RadioGraphics. 2016;36(3):783-99.
9. Morita M, Miyauchi A, Okuda S, et al. Charcot spinal disease after spinal cord injury. J Neurosurg Spine. 2008;9(5):419-26.
10. Allen RT, Lee YP, Stimson E, et al. Bone morphogenetic protein-2 (BMP-2) in the treatment of pyogenic vertebral osteomyelitis. Spine. 2007;32(26):2996-3006.
11. Lee JS, Suh KT. Posterior lumbar interbody fusion with an autogenous iliac crest bone graft in the treatment of pyogenic spondylodiscitis. J Bone Joint Surg Br. 2006;88(6):765-70.
12. Chang CW, Tsai TT, Niu CC, et al. Transforaminal interbody debridement and fusion to manage post discectomy discitis in lumbar spine. World Neurosurg. 2019;121:755-60.
13. Lu ML, Niu CC, Tsai TT, et al. Transforaminal lumbar interbody debridement and fusion for the treatment of infective spondylodiscitis in the lumbar spine. Eur Spine J. 2015;24(3):555-60.