Onset of a Charcot spinal arthropathy at a level lacking surgical arthrodesis in a paraplegic patient with traumatic cord injury

Luca Proietti · Enrico Pola · Luigi A. Nasto ·
Laura Scaramuzzo · Carlo A. Logroscino

Received: 24 September 2008 / Revised: 12 May 2009 / Accepted: 15 May 2009 / Published online: 7 June 2009
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Abstract The study design included a case report of Charcot spinal arthropathy treated with posterior and anterior spinal instrumentation. The objective of the study was to report an unusual case of Charcot spinal arthropathy as a late complication of traumatic spinal cord injury in a patient previously treated with a long posterior thoracolumbar instrumentation and postero-lateral fusion. A 33-year-old man with T10–T11 complete paraplegia presented with focal low back pain, kyphotic deformity of the lumbar region with L2–L3 fracture–dislocation and hardware failure. Our treatment consisted of a circumferential arthrodesis performed with a combined anterior and posterior approach. Spinal stabilization was achieved and the patient was pain free and able to resume a sitting posture. This report suggests that the development of a Charcot spine arthropathy must always be considered as a late complication of a spinal cord injury. Moreover, we would emphasize the fundamental role of a strict clinical and radiological follow-up in order to detect an early Charcot spine complication.

Keywords Spinal cord injury · Arthrodesis · Charcot spine · Vertebral fracture

Introduction

Charcot spinal arthropathy is described as a neuropathic condition of the spine characterized by loss of the joint protection mechanisms caused by a damage of the afferent pathways [2, 6]. In particular, the total or partial loss of the sensitive and the proprioceptive pathways in patients with a spinal cord injury can lead to a progressive joint destruction involving an intervertebral disc and two adjacent vertebral bodies. The resulting segmental instability can be followed by a complete loss of vertebral joint function. Even if it can be still considered a rare condition, several reports show that the Charcot spine is a possible late complication of spinal surgery in long-standing paraplegic patients [5, 6]. Posterior spinal stabilization and laminectomy [1, 4] have been previously hypothesized as possible surgical contributory factors of the onset of Charcot arthropathy in spinal cord injuries.

In this report, we describe a case of lumbar vertebral dislocation after a posterior spinal instrumentation and arthrodesis in a traumatic spinal cord injury. This report suggests that the possibility of a vertebral dislocation below the neurological injury level must always be considered as a possible late complication in patients with Charcot spine secondary to spinal cord injury.

Case report

A 33-year-old male with a 10-year history of complete T10 paraplegia (Frankel A injury) presented to the Department of Orthopaedics and Traumatology at the Catholic University Hospital in Rome in October 2007. He suffered a T10/T11 fracture/dislocation sustained in a motor vehicle accident in 1997. He was treated at another institution with

L. Proietti (✉) · E. Pola · L. A. Nasto · L. Scaramuzzo ·
C. A. Logroscino
Division of Spinal Surgery,
Department of Orthopaedics and Traumatology,
Catholic University Hospital,
Largo A. Gemelli 8, 00168 Rome, Italy
e-mail: proiettil@yahoo.it

Fig. 1 Lateral (a) and anteroposterior (b) radiographs showing posterior instrumentation with proximal hooks and distal pedicles screws from T5 to L3 and a bone graft postero-lateral fusion from T6 to L2 taken at the time of injury

a posterior instrumentation with proximal hooks and distal pedicle screws from T5 to L3 and a bone graft postero-lateral fusion from T6 to L2 (Fig. 1). In 2007, 10 years after the injury, the patient presented to our division because of a focal low back pain. Physical examination showed a kyphotic deformity of the upper lumbar spine with very superficial skin breakdown at the apex of the curve (Fig. 2). He had flaccid, areflexic lower extremities. He also reported a “crunching” noise inside his back when transferring from the wheelchair to the bed. He was unable to maintain the sitting posture. Laboratory analysis

revealed no signs of discitis/osteomyelitis or urinary tract infection. Radiographic evaluations showed a spinal instability and a marked kyphosis centered on L2 with a complete pull-out of the distal pedicle screws in L3 and subsequent hardware failure (Fig. 2b). Despite the failure of the distal fixation, the primary fracture site showed a complete healing with posterior bone fusion extended to L2 (Fig. 3). Moreover, plain X-ray films of the thoraco-lumbar junction revealed extensive anterior L2–L3 subluxation. The patient underwent a combined surgical approach in order to obtain circumferential arthrodesis with posterior pedicle screws fixation and anterior fusion. The first step consisted of a posterior approach in order to remove the entire instrumentation and to perform pedicle screws titanium fixation in T12, L1, L4 and L5. The second step consisted of a thoracotomy using a retro-diaphragmatic anterior approach to the thoracolumbar spine through the 11th rib. After the pleural cavity was accessed, a semilunar cut at the periphery of the diaphragm was performed in order to remove the disc between L1–L2 and L3–L4. Subsequently, a titanium cage with autologous rib bone graft and a titanium low profile plate fixed with four intrasomatic screws were implanted. Post-operative evaluation showed an improvement of the sitting posture. Moreover, radiographic examination revealed a restored thoraco-lumbar mechanical stability (Fig. 4). The patient was mobilized in his wheelchair 7 days after surgery. He was discharged without need of supportive cast and was able to maintain an adequate sitting posture and to transfer independently without any instability. At a follow-up of 3 months, the patient had total relief of the low back pain. The patient was subsequently lost to follow-up.

Fig. 2 a Kyphotic deformity in the upper lumbar spine with a very superficial skin breakdown at the apex. b Lateral radiograph of patient showing Charcot joint centered in L2 with a complete pull-out of distal pedicle screws in L3

Fig. 3 Intraoperative image showing a complete healing of the site of the primary fracture and a complete bone fusion extended to L2

Discussion

In this report, we describe a patient who presented Charcot spinal arthropathy as a late complication of traumatic spinal cord injury. In patients suffering from spinal cord injury, repeated joint microtraumas can progress to spinal instability and hardware failure due to the loss of sensitive and proprioceptive information [8]. The mean time of appearance of this complication is generally 10–20 years (range 1–42 years) as described by Morita et al. [3]. In our patient the symptoms developed 10 years after the injury and spinal instrumentation. At the time of admission to our institution, the patient presented a pattern of flaccid paraplegia with progressive loss of spasticity and an audible “crunching” noise with motion of the trunk, typical signs of suspicious Charcot arthropathy [3].

Actually, there are no established guidelines for treatment and prevention of the Charcot spine arthropathy as a late complication of traumatic spinal cord injury. Moreover, even the correct treatment of traumatic thoracolumbar fractures is highly debated. In our opinion, the traumatic lesion was correctly treated at the beginning with a long posterior instrumentation and with thoracic postero-lateral fusion that appeared still well structured many years after surgery. The long posterior instrumentation cranially extended to T5 ensures a good mechanical stability in order to prevent complications related to the topping off phenomena. Moreover, the caudal extension to L3 is correct considering that the injury level (T10–T11) is near the thoraco-lumbar junction as suggested by Standaert et al. [5]. It is well known that posterior fixation allows primary mechanical stability, while biological secondary stability is strictly dependent on the posterior bone fusion. In this report, we would emphasize the fundamental role of arthrodesis as not only a pedicle screw fixation implant salvage, but also as a valuable strategy to prevent joint instability that can occur as a late

Fig. 4 Lateral (a) and anteroposterior (b) radiographs after a combined approach for decompression, fixation and fusion showing adequate alignment and kyphosis correction with a restored thoracolumbar mechanical stability

complication in paraplegic patients. Given the low rate of Charcot spine development as a late complication of traumatic spinal injuries (approximately 60 cases published) as compared to the annual rate of new vertebral fractures with neurological injury in the US (7,000–10,000 each year [7]), we recommend a posterior instrumentation and fusion focused on giving primary stability to the affected level, according to the “current thinking”. Moreover, even if highly debated, there is no evidence in medical literature about the effectiveness of combined posterior and anterior surgical approaches in preventing Charcot spine development.

This report suggests that the development of a Charcot spine arthropathy in every active paraplegic patient presenting with back pain, back deformity caudal to the sensory level, and flaccid paraplegia must always be considered. We consider it extremely important, in these types of vertebral injuries, to perform a strict clinical and radiological follow-up in order to detect an early Charcot spine complication.

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

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