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Case Report

Acute Lumbosacral Plexopathy Following Femoral Fracture: An Unusual Association

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Abstract

Background: Post traumatic lumbosacral plexopathy (LSP) is a well-known condition following pelvic fracture or abdominal trauma and surgery. A rare condition of LSP has been reported in the literature following femoral shaft fractures.
Case Report: Two cases of LSP after bilateral femoral shaft fracture presented to our center. In both cases, the mechanism of injury was a high energy trauma without any signs or symptoms of pelvic or spinal injury. Electrodiagnostic studies confirmed acute plexopathy and spontaneous recovery occurred in both.
Conclusion: LSP can be seen in association with fractures or traumas far from anatomical location of the plexus. Multidisciplinary approach and complete accurate examination are mandatory for diagnosis management of the condition.

Keywords: Femoral Fractures; Lower Extremity; Lumbosacral Plexus

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Background

The lumbosacral plexus provides the nerve supply to the lower limb and pelvic region (1). As the plexus and its components move through a long and complex route, it can be affected by several causes. Tumors with compression effect, infection, trauma, surgery, radiation, inflammatory conditions, and autoimmune involvement are some causes of plexus dysfunction (2-5).

Lumbosacral plexopathy (LSP) following orthopedic trauma or surgery is a relatively rare condition. In traumatic patients, as it usually occurs during a high energy trauma, definite cause and diagnosis are missed in most cases (6). Vertically displaced pelvic fractures, horizontal sacral fractures, and by a lower incidence, acetabular fractures are some underlying conditions (7). Plexopathy after injuries distal to the pelvic ring is limited only to case reports (8). This paper is a report of two cases with acute LSP after fracture of the lower extremity without obvious injury of the lumbar spine or pelvic rim.

Case Report

Case 1: A 34-year-old man presented to the emergency department (ED) after a car accident with impression of concomitant bilateral femoral shaft fracture and right femoral neck fracture. On the complete clinical examination, thoracic, abdominal, pelvic ring, and spine were normal without any tenderness or other signs of trauma. The neurological examination of distal extremities (including sensory and motor assessments) was in the normal range without any deficit. We were not able to evaluate the proximal parts such as the knee and hip due to multiple fractures and distracting injuries. On the computed tomography (CT) scan of the pelvis and lumbosacral spine, there was no fracture, dislocation, or any other pathologic findings.

At first, the fractures of the left femoral neck and shaft were fixed with dynamic hip screw (DHS) combined with cannulated anti-rotation screw or locking plate for the neck and shaft, respectively. After three days, fixation of the right femoral shaft fractures was performed by intramedullary nailing (IMN). In both stages, the patient was under general anesthesia, placed on a traction table in a supine position. The tourniquet was not used at any stage and there were no intraoperative complications including bleeding or other unpredicted events. However, the surgery was prolonged in both stages for about four to five hours (Figure 1).

After the second stage and following the partial recovery, neurological examination revealed motor and sensory deficits in both lower limbs. The findings included the lack of sensation in the whole limb, paralysis of the ankle and knee, and inability to raise the leg straightly. Considering normal lumbosacral and pelvic examination, CT scan, and magnetic resonance imaging (MRI), we decided to examine the patient with the electrodiagnostic assessment after three weeks.

The electromyography (EMG) revealed a neurogenic pattern with reduced recruitment and evidence of active denervation. The nerve conduction study (NCS) showed the absence of all compound muscle action potentials (CMAPs) and sensory nerve action potentials (SNAPs) of both limbs. The F-response was delayed and impersistent. All these findings were in favor of subacute LSP.

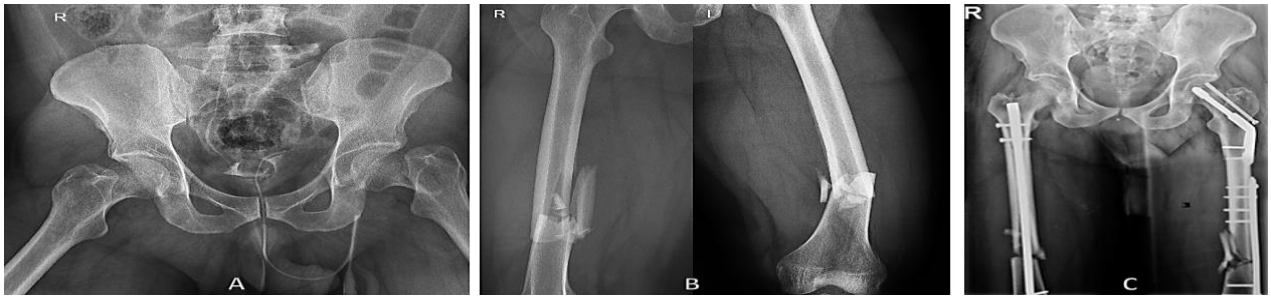

Figure 1. A: Preoperative anteroposterior (AP) pelvic X-ray demonstrating femoral neck fracture in the left side without obvious pelvic ring fracture, B: Femoral shaft fracture in both femurs on the plain X-ray, C: Postoperative pelvic and bilateral femoral X-ray

A routine rehabilitation program including active and passive range of motion (ROM) and muscle strengthening was started for the patient. On serial follow-up visits, we observed significant improvement in motor and sensory functions. During this period, the chief complaint of the patient was severe dysesthesia and burning pain.

After 8 months and due to the presence of nonunion in the right side femur, reoperation with bone graft and nail exchange was performed. In the last visit on the 16-month follow-up, fracture union was achieved completely. The neurological examination was normal except for the lack of ankle dorsiflexion on the right side and weakness of the knee extension on the left side.

Case 2: A 26-year-old man was admitted to ED with multiple traumas after a rollover event. In the secondary survey and after stabilization, the radiographic study revealed a concomitant fracture of the right femoral shaft, intraarticular distal femur, and tibial shaft with the normal neurovascular examination. The open fracture of the femoral shaft caused a 6-cm wound in the anterior thigh. The spine and pelvis were normal on examination and spiral CT scan.

In the supine position and on a conventional surgical table, we fixed the distal femur with open reduction and internal fixation (ORIF) through the medial subvastus approach and diaphyseal fracture with IMN. The total time of surgery was about 6 hours and there were no major intraoperative complications.

We scheduled the patient for fixation of the tibial shaft fracture, but the neurologic examination on day 2 revealed paralysis of ankle flexion and extension with severe hypoesthesia distal to the knee. As the complete motor examination was not feasible because of the multiple fractures, the paralysis was assumed to be due to the peripheral nerve injury, probably the sciatic nerve. Therefore, the tibial shaft fracture was fixed with IMN (Figure 2).

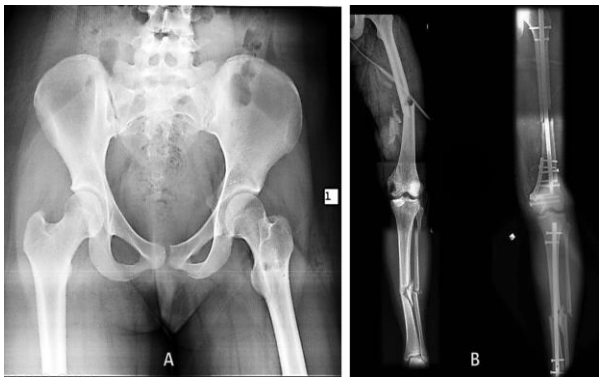

Figure 2. A: X-ray image indicating a normal pelvis without pelvic ring fracture, B: Plain X-rays demonstrating femoral and tibial shaft fractures in addition to distal femoral fracture, before and after surgical fixation

In the follow-up visit in the third week, the patient had weakness in knee extension, inability in flexion and extension of the hip, plus sensory deficit in the leg and distal half of the thigh. These findings made us vigilant to evaluate the patient for plexopathy or other neurological conditions. Similar to the first case, he had severe and disabling pain and dysesthesia in the whole limb.

The EMG/NCS findings were in favor of subacute unilateral LSP with signs of active regeneration. The rehabilitation program for this case was similar to that of the first case, with focus on ROM preservation and muscle strengthening. The motor and sensory function gradually improved and the patient was fully recovered at the 7-month follow-up without any remnant deficit.

Discussion

Posttraumatic LSP is a well-known condition following pelvic ring traumas. The occurrence of this complication following femoral fractures without associated pelvic injury is a rare condition. Kutsy et al. reported 20 cases of LSP following pelvic injury in addition to two cases with isolated femoral shaft fractures. The prevalence of plexopathy was significantly higher in patients with sacral fracture or sacroiliac joint disruption (6).

Stoehr reported 53 cases of LSP 10 of which happened following femoral shaft fracture and 17 after total hip arthroplasty. When the location of the injury is far from the lumbosacral plexus, like femoral shaft fracture, the physician should differentiate between plexopathy and more common conditions such as multiple proximal injuries to the nerves of the plexus (8).

For this purpose, a complete neurologic examination, MRI of the plexus and thigh, and if required, EMG/NCS should be performed (9).

In addition to fracture pattern and location, some features were similar in both of our cases. For instance, both were obese males with high energy trauma and long surgery duration. It should be kept in mind that in the absence of a proper primary survey due to the patients' condition, it could not be determined whether the injury was due to the initial trauma or positioning and other intraoperative secondary insults. Evaluating the patient for other conditions such as paralysis due to the tourniquet or traction table is an important diagnostic step (10, 11). Since the chief complaint of patients was severe burning pain and dysesthesia, we had to consider idiopathic LSP as an important differential diagnosis (12). Although there is no effective treatment for both traumatic and idiopathic forms, it is important to have a certain diagnosis in trauma patients for medicolegal reasons.

Throughout the treatment course of these cases, much of the focus was on the management of orthopedic

problems, and lumbosacral plexus MRI was not conducted due to technical issues. As we made the diagnoses with electrodiagnostic study, we cannot decisively differentiate plexopathy with multiple root avulsion or multiple peripheral nerve injury.

As a relatively common problem, when orthopedic surgeons face a posttraumatic or postsurgical neurological deficit, there is a lack of communication with neurologists for the localization of the injury (13). Beside evaluating the joint stiffness, muscle or tendon injuries, complex regional pain syndrome, and disuse atrophy, a complete neurological survey seems to be mandatory in such circumstances.

Conclusion

Since the LSP is an uncommon phenomenon following fractures of the lower extremity, orthopedic surgeons should be cautious in such cases and do not consider all motor defects as the results of fracture or postoperative pain. A meticulous examination of the sensory and motor function is required in any follow-up visit. To avoid missing the LSP, the physician should differentiate neurological causes of the motor deficit from musculoskeletal conditions by the use of EMG/NCS and lumbosacral plexus MRI.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgments

None.

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