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Monoradiculopathy and Secondary Segmental Instability Caused by Postoperative Pars Interarticularis Fracture: A Case Report

Postoperatif Pars İnterartikülaris Fraktürüne Bağlı Gelişen Monoradikülopati ve Sekonder Segmental İnstabilite:Olgu Sunumu

Tuncay KANER[1]
İbrahim TUTKAN[2]

[1] Pendik State Hospital, Neurosurgery Clinic, Istanbul, Turkey
[2] Validebag State Hospital, Neurosurgery Clinic, Istanbul, Turkey

ABSTRACT

Instability can develop after lumbar spinal surgery. What is also known as secondary segmental instability is one of the important causes of failed back syndrome. In this paper, we described a 45-year-old female patient who was diagnosed with secondary segmental instability caused by left L3 pars interarticularis fracture after a high lumbar disc surgery and was subsequently treated with re-operation. We evaluated the clinical course, diagnosis, and treatment methods for secondary segmental instability caused by postoperative pars interarticularis fracture. Furthermore, we emphasized the importance of preserving the pars interarticularis during upper lumbar disc surgeries in order to avoid a potential stress fracture.

KEYWORDS: Herniated disc, Lumbar vertebrae, Pars interarticularis, Failed back syndrome, Radiculopathy

ÖZ

Lomber omurga cerrahisinden sonra instabilite gelişebilir. Aynı zamanda sekonder segmental instabilite olarak bilinen bu durum başarısız bel sendromunun önemli nedenlerinden biridir. Bu yazıda biz üst seviye lomber disk cerrahisinden sonra sol L3 pars interartikülaris fraktürüne bağlı gelişen sekonder segmental instabilite tablosu ile tanı koyduğumuz 45 yaşında bayan bir hastayı tanımladık. Hasta bu durumdan dolayı tekrar operasyona alınarak tedavi edildi. Biz burada postoperatif pars interartikülaris fraktürüne bağlı gelişen sekonder segmental instabilitenin klinik seyrini, tanı ve tedavi yöntemlerini değerlendirdik. Bunun yanında, üst seviye lomber disk cerrahileri esnasında potansiyel bir stres fraktüründen kaçınmak için pars interartikülarisi korumanın önemini vurguladık.

ANAHTAR SÖZCÜKLER: Disk herniasyonu, Lomber omurga, Pars interartikülaris, Başarısız bel sendromu, Radikülopati

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Correspondence address:
Tuncay KANER
E-mail: tkaner2002@yahoo.com

INTRODUCTION

Instability can develop after lumbar spinal surgery (9,10,16). Segmental instability with radicular pain caused by pars interarticularis (PI) fracture in early postoperative stages is not an unusual complication. Although not all patients with postoperative pars fracture are symptomatic, some may have lower back or leg pain caused by the displacement of the fracture fragments (7,21). Postoperative diagnosis can be made with x-rays, spinal computed tomography (CT) and magnetic resonance imaging (MRI) (7,12,14). Typically, patients become symptomatic after a period of post-surgical recovery. New pain may arise as local tenderness in the back and increased pain with unusual movements, but usually with relief by stretching and immobility. However, the radicular pain may sometimes be intolerable for patients when they take steps. Lower back and radicular pain after lumbar spine surgery occur as residual or recurrent symptoms. Misdiagnosis, operation on the wrong spinal level, neurological degeneration, discitis, arachnoiditis, facet fracture, recurrent disc herniation, spinal stenosis, and spinal instability are some of the reasons for failed disc surgery (8,19,20). However, recurrent disc herniation is the most important reason for the continual, sometimes permanent symptoms (4). Thus, segmental instability caused by PI fracture should be considered when postoperative lower back pain with radiculopathy is encountered.

CASE REPORT

A 45-year-old female patient was admitted to our hospital with complaints of leg and lower back pain that also extended towards the left knee. Physical examination revealed difficulty walking due to left leg and knee pain. During neurological examination, a positive left Laseque's sign and a positive left femoral stretch test were identified. Left knee extension strength was 3/5. Additionally, hypoesthesia in left L3, L4 dermatome, abolic left patellar reflex, and 2 cm atrophy of the left quadriceps were discovered. MRI of the lumbar spine showed a left posterolateral disc herniation at L3-L4 (Figure 1, 2). There was no evidence of on the patient's pre-operative radiographic investigation, and a microdiscectomy was consequently performed. The patient felt relief from the leg pain immediately after the surgery. However, a localized pain was described in the left knee. MRI examination of the lumbar region and the left knee was performed on postoperative day 1. MRI of the left knee revealed liquid collection and meniscus in the knee joint. Other

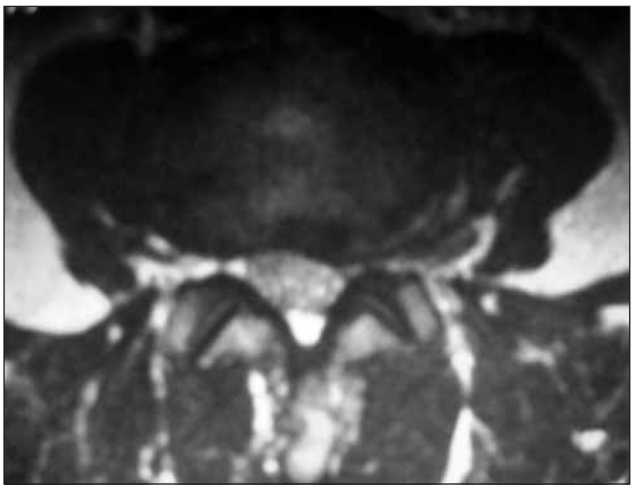

Figure 1: *Preoperative axial magnetic resonance image.*

Figure 2: *Preoperative sagittal magnetic resonance image.*

than postoperative changes, the lumbar MRI did not reveal any unusual feature. After orthopedic consultation, an elastic bandage was applied on the left knee, and three weeks of bed rest was advised. Orthopedic consultation revealed that the damage in the left knee joint could be the result of knee trauma due to weakness and pain caused by lumbar disc herniation during the preoperative stage since the patient was struggling to walk. The patient was subsequently discharged. While being monitored at home, the patient started complaining of left femoralgic pain on postoperative day 15, and the pain continued in the following days. The patient was readmitted to the hospital, and lumbosacral x-rays, electromyography (EMG), lumbar MRI, and routine biochemistry were performed. Lumbosacral x-rays showed PI fracture in left L3 as well as left scoliosis (Figure 3). Neurological

examination indicated nerve root paralysis in left L3. During subsequent surgical treatments, resection of the left L3 pars interarticularis and release of the nerve root in left L3, and posterior stabilization with transpedicular screw system and fusion were performed (Figure 4, 5). In the postoperative period, the patient felt relief from both the lower back and leg pain. The patient was pain-free after a one-year follow up period.

Figure 3: *Pars fracture in L3 and left scoliosis of the spine as revealed in anteroposterior lumbosacral x-ray on postoperative day 18.*

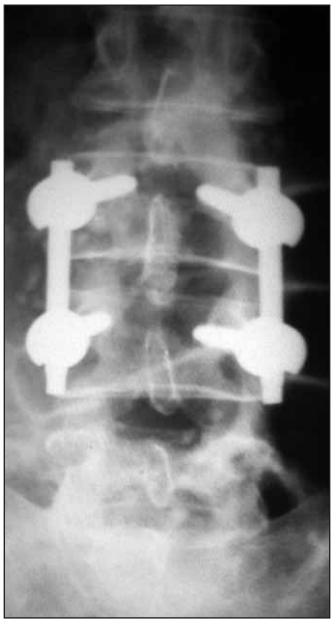

Figure 4: *Lumbosacral A-P x-ray after posterior stabilization*

Figure 5: *Lateral lumbosacral x-ray after posterior stabilization*

DISCUSSION

Residual and recurring post-operative symptoms are quite common in lumbar spinal surgeries. The most common causes of failed back syndrome are unsatisfactory preoperative imaging, remaining disc materials, recurrent disc herniation, another disc herniation in range, peridural scar tissue, pseudomeningocele, epidural hematoma, lumbar spinal stenosis, permanent nerve root deficit, arachnoiditis, discitis, spondylosis, and segmental instability (1,3,4,5,7,11,13,15,16,17). Chronic lower back pain following lumbar disc surgery could be due to secondary segmental instability. In their radiographic study, Frymoyer et al. (9) reported that 20% of the patients who had discectomy had abnormal translational deformity with translation of at least 3 mm 10 years postoperatively. Abnormal translations were found more commonly at the L4-5 level, particularly in women (9). Three different patterns of segmental instability, which were described by Markwalder et al, included postoperative spondylolystesis, lateral rotational instability and postoperative scoliosis (16). Even lumbosacral x-rays by themselves can sometimes be useful in cases of spondylolystesis, instability as well as scoliosis, (2). Lumbar spine radiography including films showing weight-bearing flexion and extension during abnormal movements may provide further evidence for instability (4). Another reason for the failed back syndrome and subsequent recurrent lower back pain and radiculopathy is the instability due to PI fracture in early postoperative stages. This is not an unusual complication, and it is one that can usually be avoided during the primary procedure. Symptoms of

postoperative pars fracture typically start after a period of post-surgical well-being. The new pain is often characterized as a local tenderness and increased pain from unusual movements, with relief by stretching and immobility. Diagnosis can be achieved by x-rays with lateral lumbosacral hyperflexion and hyperextension views, spinal CT, and MRI. The PI fracture can be identified on x-rays, particularly in oblique views. Moreover, other findings of instability including postoperative scoliosis and spondylolystesis can sometimes also be observed. However, spinal CTs may sometimes result in faulty diagnosis since the axial sections can be parallel to the pars fracture line. On the other hand, the PI fracture lines can usually be noticed in sagittal sections (21). Although the sensitivity of MRI to soft tissues is known, as in cases of lumbar herniated disc, some studies have reported that MRI was helpful and resulted in accurate diagnosis of PI fractures and defects. Johnson et al. used MRI as a first-line tool of examination for patients with lower back pain. They successfully identified PI anomalies from routine sagittal MRI sections without using additional sequences (14).

Our patient was treated with high lumbar disc surgery and the monoradiculopathy and lower back pain were observed starting postoperative day 15. She was suffering from severe left femoralgia and lower back pain that prevented her from taking steps. Postoperative MRI did not reveal any recurrent disc herniation. We thought that the difficulty in walking was due to excessive pressure on the meniscus in the left knee, and the knee pain thereby forced the patient to commit too much torsional force on the vertebrae and caused the post-operative PI stress fracture in left L3. Furthermore, we thought that the pars was likely thinned/dissected in order to access the herniation at the time of the initial surgery, but that the pars subsequently failed during the post-operative period. There was no evidence of osteoporosis to indicate a stress fracture as a cause of pars fracture post-operatively. Neither pre-op MRI nor lumbosacral x-rays indicated any sign of osteoporosis.

Great care must be given to preserve the PI in the upper lumbar spine because of the differences in the dimension of the spinal canal between the upper lumbar and lower lumbar spines (18). The PI is recognized as one of the weakest parts of the lumbar spine (6). Spinal surgeons often limit bone removal in this region during surgical procedures in order to avoid any postoperative complications. In an anatomic investigation, Alexander et al. demonstrated that the removal of the lateral half of the PI led to considerable increase in stress at the L3 and L4 neural arch. In the same study, the investigators showed that the removal of the lateral fourth of the PI had minimal influence on the stress distribution at the remaining neural arch (13). The patient was not given a lumbosacral corset after the surgery. Postoperative scoliosis and PI fracture in left L3 were detected on x-ray. Together with the patient's clinical observations, such radiological findings were evaluated as secondary segmental instability. Hyperflexion and hyperextension views could not be captured due to the patient's severe lower back and left leg pain. The patient was operated on again with the diagnosis of secondary segmental instability. Resection of the left L3 pars fracture was then performed. Posterior stabilization with transpedicular screw system in L3 and L4 and posterolateral fusion were executed. The patient subsequently experienced relief from lower back and leg pain in the postoperative stage.

A similar case report could not be identified in the literature. Therefore, we advise that surgeons expose the lateral border of the pars at the time of surgery in order to understand its location and to avoid a potential PI stress fracture. The biomechanical consequences of removing various degrees of the pars should not be forgotten. When monoradiculopathy with instability caused by postoperative pars stress fracture is diagnosed, the treatment should be a second operation in which removal of the PI fracture, decompression of the nerve root, and posterior stabilization and fusion are performed.

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