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Case Report

Unilateral Pedicle Fracture Accompanying Spondylolytic Spondylolisthesis

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Unilateral pedicle stress fracture accompanying spondylolytic spondylolisthesis is rare even in the elderly. Most are associated with major trauma, previous spine surgery, or stress-related activity. Here, the authors describe an unique case of unilateral pedicle fracture associated with spondylolytic spondylolisthesis at the L5 level, which was successfully treated by posterior lumbar interbody fusion with screw fixation at the L5–S1 level. As far as the authors' knowledge, no such case has been previously reported in the literature. The pathophysiological mechanism of this uncommon entity is discussed and a review of relevant literature is included.

Key Words : Pedicle · Fracture · Spondylolysis.

INTRODUCTION

Pedicle fractures in the spine are uncommon even in elderly patients[5,7]. Most cases have been reported in association with previous spine surgery or in highly active athletic individuals. Pedicles have great intrinsic strength and short moment arms, and therefore, can resist substantial cyclic shear forces. Spondylolysis and fracture of the pars interarticularis are the most common injuries of the neural arch. Several reports have investigated fractures of the contralateral pedicle in patients with unilateral spondylolysis, especially during advanced stages of the pars defect, and in these reports, it was proposed that instability of this segment created by a unilateral pars defect leads to fracture of the contralateral pedicle[3,8]. However, unilateral pedicle fracture accompanying spondylolytic spondylolisthesis is extremely rare. Here, we report a rare case of unilateral pedicle fracture accompanying bilateral spondylolytic defects in a patient with spondylolisthesis in the absence of any major trauma, previous spine surgery, or stress-related activity.

CASE REPORT

A 55-year-old man experienced progressively worsening low back and bilateral leg pain over 7 months. He had a history of mild back pain of several years duration but the leg pain had progressively increased without any traumatic episode or spinal surgery. A neurological examination revealed no motor weakness or sensory change, but marked tenderness was in the low back area with reduced back motion, especially in backward extension. Plain radiographs showed spondylolytic spondylolisthesis at the L5 level and irregularity of the L5 pedicle suggesting a pedicle fracture (Fig. 1). Computed tomography (CT) and magnetic resonance imaging (MRI) revealed an unilateral right pedicle fracture at L5 level accompanying spondylolytic spon-

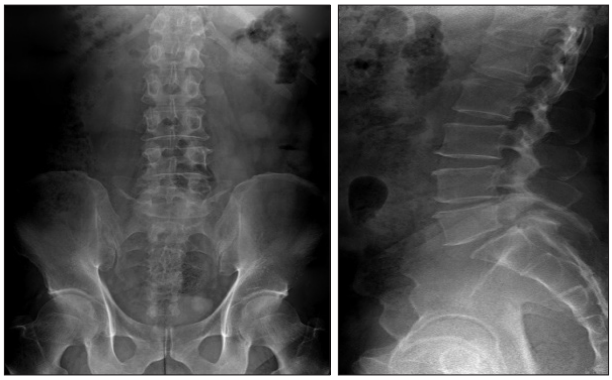

Fig.1. Plain radiographs showing spondylolytic spondylolisthesis of L5 on S1.

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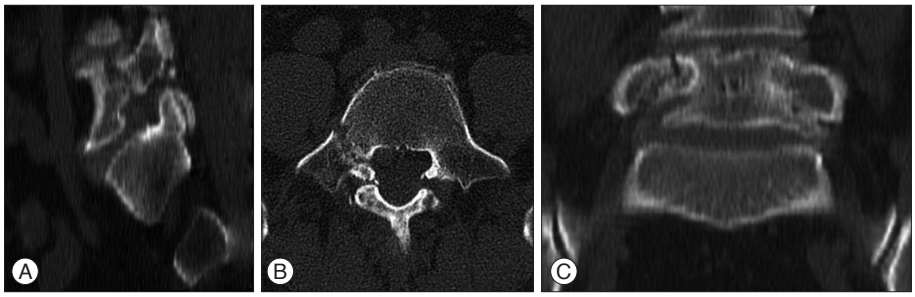

Fig. 2. Sagittal (A), axial (B), and coronal (C) computed tomographic scans showing a right pedicle stress fracture with sclerosis and spondylolysis at L5.

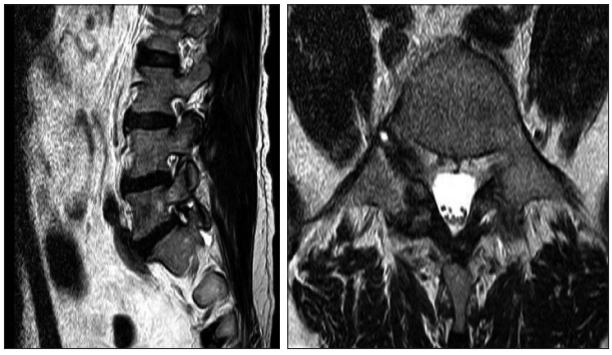

Fig. 3. T2 weighted magnetic resonance images showing the right pedicle fracture and foraminal stenosis caused by spondylolisthesis at the L5–S1 level.

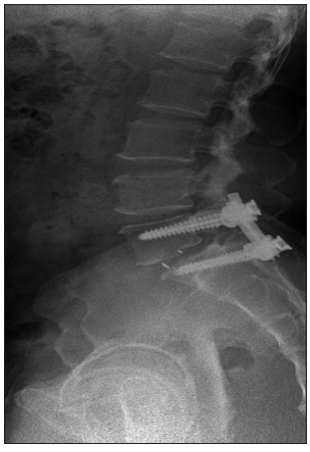

Fig. 4. A plain lateral radiograph at 12 months after posterior lumbar interbody fusion.

dylolisthesis (Fig. 2, 3). In addition, foraminal stenosis was observed at the L5–S1 level secondary to spondylolisthesis. He was treated by posterior lumbar interbody fusion of L5–S1 with percutaneous screw fixation. At his 12 month follow up assessment, no residual low back pain or radiating pain was evident and he had returned to normal activities (Fig. 4).

DISCUSSION

Unilateral spondylolysis with sclerosis and hypertrophy of the contralateral side of the neural arch has been described in the literature[3,8]. Sclerosis of contralateral side is believed to occur as a compensatory mechanism secondary to the redistribution of forces in an unstable neural arch resulting from a contralateral defect in the pars interarticularis[1]. Pedicle stress fractures have been reported in association with contralateral spondylolysis, and up to 40% of such pedicles exhibit reactive changes on MR images[10]. Sherman et al.[9] reported 11 patients with reactive sclerosis and hypertrophy of the pedicle and lamina contralateral to unilateral spondylolysis. They proposed that if the buttressing effect is insufficient to resist continued stress on the lumbar spine, a bilateral or unilateral defect of the pars interarticularis might also develop. Pedicle fractures have also been reported in association with bilateral spondylolysis in otherwise normal adults, but the pathophysiological mechanism still remains unknown[2]. However, unilateral pedicle fracture accompanying bilateral spondylolytic defects with spondylolisthesis is extremely rare and to the best of our knowledge, no case of spondylolisthesis accompanying a unilateral pedicle stress fracture has been previously reported. In our patient, fractures were not fresh, because some sclerotic change was evident at fracture margins. Jeong et al.[6] reported a contralateral pedicular fracture associated with unilateral spondylolysis at the L5 level that was successfully treated by rehabilitation and activity modification. However, our patient, who showed bilateral spondylolytic defects with spondylolisthesis and foraminal stenosis, was treated by screw fixation and interbody fusion for stabilization. We fused the L5−S1 segment to stabilize the pedicle fracture and spondylolytic spondylolisthesis, and the stabilization resulted in pain relief and allowed our patient to return to normal activities. Repetitive mechanical stress fractures in posterior elements are usually located in the pars interarticularis or to a substantially lesser extent, in the pedicle. The pedicle has great intrinsic strength and a short moment arm from the vertebral body, and can therefore resist substantial cyclic shear force[4]. Sometimes diagnosis of pedicle fracture in a patient with unilateral spondylolysis is possible by plain radiography. Combined pars defect is easily detected and linear cleft or sclerosis of the pedicle may be demonstrated in some of these patients. However, the sensitivity of plain radiography is limited. On the other hand, CT, which is widely regarded as the method of choice for the diagnosis of such lesions, clearly demonstrated the stress fracture as a linear defect at the base of the sclerotic pedicle.

CONCLUSION

We report a rare case of unilateral pedicle fracture accompanying spondylolytic spondylolisthesis without predisposing risk

factors. The understanding of pathophysiological mechanism of this uncommon entity is important. Surgical stabilization of pedicle fracture should be considered. Our experience suggests that PLIF can be an effective treatment to obtain stabilization.

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