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Case Report

Contralateral Pedicular Fracture with Unilateral Spondylolysis

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Although most authors regard contralateral pedicular fracture with unilateral spondylolysis as an unstable condition and recommend surgical management when immobilization fails in promoting bony healing of the fracture, few researchers have investigated the natural history of pedicle fracture or the causal relationship between symptoms and the fracture. In addition, there are no detailed guidelines that address the management of this disease. We report a rare case of contralateral pedicular fracture associated with unilateral spondylolysis at the L5 level which was successfully treated by rehabilitation with activity modification.

KEY WORDS : Lower back pain · Lumbar vertebrae · Spondylolysis · Stress fracture · Guidelines.

INTRODUCTION

The healing potential of unilateral spondylolysis is higher than that of bilateral spondylolytic defects[2,5]. Even in unhealed cases that are treated conservatively, forward slippage or disc degeneration are not likely[2,10]. Beutler et al.[2] reported that 8 subjects with unilateral defects never experienced slippage over the course of their study. In their study, all subjects with unilateral spondylolysis had minimal symptoms after 30 years of follow-up. Therefore, unilateral spondylolysis of a lumbar vertebra is generally considered a clinically benign condition[2,10,11]. However, several reports have investigated fractures of the contralateral pedicle in patients with unilateral spondylolysis, especially in advanced stages of the pars defect[1,3,5-11,13,14]. Many authors have proposed that the instability of this segment created by the unilateral pars defect leads to the fracture of the contralateral pedicle[5,8,9,14]. We report a case of contralateral pedicular fracture with unilateral spondylolysis of the L5 level which was successfully treated by rehabilitation with activity modification.

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CASE REPORT

A 35-year-old man presented with a 3-month history of severe lower back pain. Vigorous physical activity, particularly bending, twisting, and lifting commonly aggravated the symptoms, whereas restriction of pain-producing activities and resting resulted in improvement, at least temporarily. He continued to carry out his normal activities despite his back pain. The patient was a mason, so his daily activities included carrying heavy stones. Past medical history was noncontributory. He denied any history of recent or remote episodes of trauma. On examination, there was no focal neurological deficit except tenderness in the low back area. Lumbar lateral and oblique radiographics demonstrated a right pars interarticularis defect with a mildly enlarged left pedicle of the L5 vertebra and lumbarization of the S1 body (Fig. 1). Lumbar spine range of motion was normal in all planes. A computed tomography (CT) scan was performed and clearly demonstrated a right side pars defect at the L5 vertebra and, surprisingly, showed a cleft at the base of the pedicle with bony overgrowth along the cleft margin (Fig. 2). At the medial margin of the cleft a bony spur encroached on the spinal canal. Magnetic resonance (MR) images showed the cleft, but revealed no evidence of perilesional bone marrow edema (Fig. 3). A bony spur encroaching on the spinal canal was also detected, but spondylolisthesis or disc degeneration was not detected at

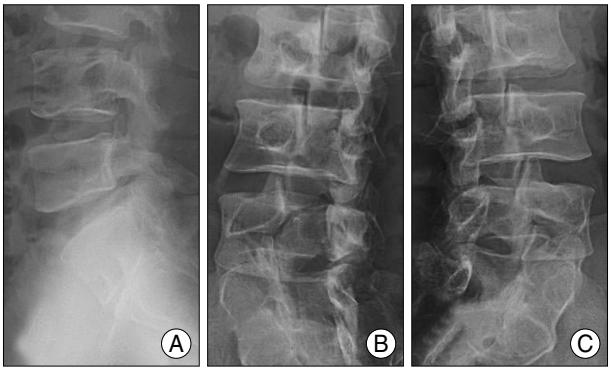

Fig. 1. Lumbar radiographics demonstrate a right pars defect with a elnaged left pedicle of the L5 vertebra and lumbarization of the S1 body. A : Lumbar lateral view demonstrates lumbarization of the S1 body. B : The right oblique view shows a defect in the right pars interarticularis of L5. C : The left oblique view demonstrates a mildly enlarged pedicle of L5.

Fig. 2. Axial computed tomography scan image through L5 showing the right side spondylolytic defect and contralateral pedicular fracture with sclerotic change of the fracture margin. A bony spur encroaches on the spinal canal at the medial margin of the fracture.

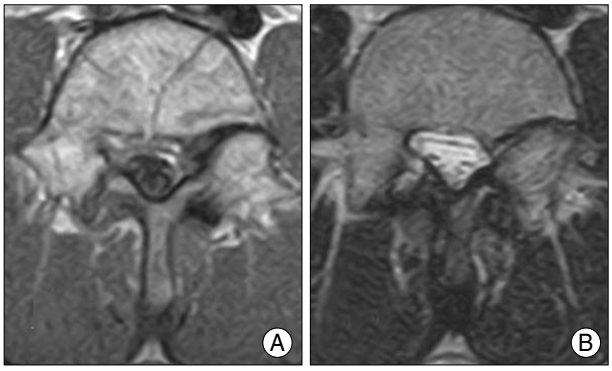

Fig. 3. Axial magnetic resonance images demonstrate the right spondylolytic defect and left pedicular fracture of L5 as seen in the computed tomography findings. There is no evidence of bone marrow edema around the fracture. A : Bone marrow signal intensity on T1-weighted image does not decrease. B : Bone marrow signal intensity on T2-weighted image does not increase in the pedicle or vertebral body.

Fig. 4. The bone scan demonstrates symmetrical isotope uptake. There is no focally increased uptake.

this level. A technetium-99m methylene diphosphonate bone scan showed no increased activity in the pedicle or vertebral bodies (Fig. 4). Under C-arm guidance, local anesthetic was injected in the left fifth lumbar pedicle, but this was not effective in controlling the lower back pain. The patient returned to his normal activity level after 3 months of rehabilitation treatment with activity modification. On follow-up assessment at 18 months, the patient had mild residual lower back pain which he tolerated without medication. A CT scan at this time showed no change of the pedicular fracture.

DISCUSSION

Although unilateral spondylolysis has been considered to be clinically benign condition comparing with bilateral spondylolysis, several reports have investigated fractures of the contralateral pedicle in patients with unilateral spondylolysis, especially in advanced stages of the pars defect[1,3,5-11,13,14]. Many authors have proposed that the instability of this segment created by the unilateral pars defect leads to the fracture of the contralateral pedicle[1,10,11,14]. It is already proved in a study using unilateral spondylolysis model. Sairyo proved that the risk of the pedicular fatigue stresses increase in axial rotation to the contralateral side of unilateral pars defect, in 12.6-fold as compared to the intact case[10]. If the patients with unilateral spondylolysis are very active in sports or labors that require trunk rotation over time, the risk of the stress fracture of contralateral pedicle will increase.

Sometimes the diagnosis of contralateral pedicular 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, its sensitivity is limited[1,4,5,11]. As we indicated in the case report to this article, CT

scan clearly demonstrated stress fracture as a linear defect at the base of the sclerotic pedicle and the widely regarded as the method of choice in diagnosis of the lesion[1,5,11,13]. However, CT is unreliable for distinguishing if the fracture is in the reparative stage or if it has already undergone fibrous healing. Bone scintigraphy and MR images are useful in detecting early fractures and thus can be used to distinguish between the reparative stage and the fibrously healed stage of fractures[4,111,12]. Actively healing fractures are characterized by a decreased bone marrow signal intensity on T1-weighted images with comparable increased signal intensity on T2-weighted images; this probably represents bone marrow edema[8,11]. A bone scan is believed to show increased uptake[12,14]. Scintigraphic findings reflect similar pathophysiologic processes in the marrow as those seen on MR images. The changes observed in MR images and a bone scan can apparently persist for months to years and can revert to normal if complete bone union or fibrous union occurs[11]. Therefore, the fracture is presumed to be in the reparative stage when MR images show bone marrow edema or scintigraphy shows focal accumulation at the fracture site; most reported cases belong to this stage[7,8,10,11,13,14]. Early diagnosis of the reparative stage is important because healing is still progressing and there is a higher chance of bony union with immobilization[7,8,11,13]. Surgical intervention is indicated when immobilization fails to promote bony healing of the fracture or continued bony overgrowth leads to a neurologic deficit[1,3,8,9]. However, when bone fracture is confirmed, but bone scan or MR images show no abnormal findings, we can presume that the fracture has already healed by fibrous union and the bone's response to stress from the fracture is already suspended. Bone union of the fracture with immobilization is no longer expected.[4] Unless spondylolisthesis or overgrowth of the bony spur develops and leads to a neurologic defect, fibrous healing of the pedicle fracture does not mean that the segment is unstable and may lead to a good clinical result, as is seen in cases of spondylolysis[3,8,9,11]. In addition, it is uncertain whether or not a fracture which has already undergone fibrous healing may produce the symptoms of lower back pain. Once stable fibrous healing is noted, we suggest that injection of local anesthetics at the stress fracture site will help to estimate the causal relationship between lower back pain and a fibrously healed fracture. If the pain is controlled by local anesthetic, we can presume that the low back pain is directly related to the fibrously healed fracture. In this case, surgical intervention is required for which several techniques including fibrous tissue removal and bone grafting have been reported[5,8,9,14].

However, when the pain is not controlled by local anesthetic, the causal relationship between the symptoms and the fracture is obscure and neither immobilization nor surgical intervention is warranted. One should then consider other possible causes of lower back pain, including musculoligamentous strain, sacroiliac joint dysfunction, facet syndrome, and other soft tissue irritation disorders that are usually diagnosed clinically and managed conservatively. Rehabilitation treatment with activity modification may improve the pain, as was found in our case. Median branch block of the lumbar spine may be an alternative management strategy for lower back pain in these patients.

CONCLUSION

The optimal clinical management of this disorder remains controversial and one should consider the stage of the fracture, the stability, and the causal relationship between the symptoms and the fracture. If it is still reparative stage, there is a chance of bony union with immobilization. Surgical intervention is indicated when immobilization fails, bony overgrowth leads to a neurologic deficit, or the fibrously healed fracture is directly related to the symptoms. However, when the causal relationship between the symptoms and the fracture is obscure, neither immobilization nor surgical intervention is warranted. One should then consider other possible causes of lower back pain and rehabilitation with activity modification may improve the pain.

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