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Case Report

The imaging and management of nonconsecutive pars interarticularis defects: a case report and review of literature

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Abstract

BACKGROUND CONTEXT: Lumbar spondylolysis is a well-recognized condition occurring in adolescents because of repetitive overuse in sports. Multiple-level spondylolysis involving consecutive lower lumbar segments are rare. Several authors have reported failure of conservative treatment in the management of multiple-level pars fractures.

STUDY DESIGN: A case report and review of previous literature is presented.

OBJECTIVE: The objectives of this case report were to present a rare case of pars fracture involving nonconsecutive segments and discuss image findings and treatment.

METHODS: The patent's history, clinical examination, computed tomography (CT), magnetic resonance imaging (MRI) findings, and treatment are reported. We also discuss the pathogenesis, various treatment options, and review the literature.

RESULTS: We present the fourth case of bilateral pars fractures involving nonconsecutive lower lumbar spine segments of L3 and L5, in a 16-year-old young adolescent footballer who presented with 4-month history of constant low back pain. After 1 year of conservative management, the more acute fractures at L3 showed complete bony union, symptomatic pain relief, and return to full sporting activity.

CONCLUSION: We report a rare case of bilateral pars fractures involving nonconsecutive segments. Multiplane reconstruction of CT images and MRI are very useful in planning treatment and follow-up. Conservative management may be used to treat multilevel nonconsecutive pars fractures.

Keywords: Spondylolysis; Spondylolisthesis; Pars interarticularis fracture

Introduction

Spondylolysis is the most common overuse sports injury of the low back with an incidence of 13% to 47% in adolescent athletes [1] but has a prevalence of 6% in the asymptomatic general population [2]. There is an inherited predisposition to hypoplastic pars that may manifest after repetitive loading, leading to a stress reaction and subsequent failure [1]. Exaggerated lumbar lordosis and a more vertical sacral alignment may place increased stress on the arch [3]. It is also associated with an increased frequency of congenital defects in the adjacent vertebrae, such as the transitional vertebrae and spina bifida [4] that can predispose to stress fractures. Spondylolytic pars lesions that are reported to occur in 27% of fast bowlers [5], 16% gymnasts [6], 23% weight lifters [6], and 27% to 48% track and field throwers [6]. It is more common in men [4], affects Caucasians two to three times more than African Americans [4], and occurs 85% to 95% at L5 and 5% to 15% at L4 [7]. A higher incidence is seen in young athletes involved in sports that require repetitive loading, extreme hyperextension, and/or rotation of the lumbar spine, which together amplifies traumatic stress to the posterior arch. Pars lesions are usually seen as a continuum with stress reaction at one end and fracture nonunion with spondylolisthesis at the other [8]. Multilevel lumbar spondylolysis is rare, and only a few articles have been reported

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in literature [9–13]. Many authors [10,11,14] have reported failure of conservative treatment in multilevel pars fractures. We present the fourth [15,16] case of bilateral pars interarticularis defects affecting nonconsecutive lower lumbar levels of L3 and L5, which showed bony union of the acute bilateral L3 pars fractures after successful conservative management.

Materials and methods

A 16-year-old previously fit and healthy teenager, involved in regular academy football training, presented with a 4-month history of insidious onset of constant low back pain. At times, the pain was severe preventing him from walking, and it was associated with bilateral buttock pain. Pain was partially relieved with rest and physiotherapy, but he was unable to return to football. There was no history of trauma. On examination, there was discomfort in lower lumbar spine. He had normal forward flexion, but lumbar spine extension was limited with reproduction of his pain. The neurologic examination was normal.

Results

The X-rays (Figs. 1 and 2) showed spina bifida occulta and spondylolysis at L5 with associated Grade I spondylolisthesis at L5/S1. There was also a spondylolysis at L3 level. A computed tomography (CT) scan (Figs. 3–5) and magnetic resonance imaging (MRI) of lumbosacral spine demonstrated a normal spinal cord, marked L5/S1 disc narrowing and bilateral foraminal narrowing, abutting both L5 nerve roots. There was edema on the short tau inversion recovery sequences (Fig. 6) within both pedicles of L3, which was tracking into the adjacent soft tissues consistent with acute bilateral pars interarticularis fractures at L3. No edema was noted at pars interarticularis defects at L5 suggesting bilateral chronic nonunion of pars interarticularis.

The patient was managed conservatively with rest, lumbosacral bracing, and physiotherapy exercises. The physiotherapy regimen included activity restriction and avoidance of overhead activities and lumbar extension movements. Therapeutic exercises included low-impact aerobic conditioning exercises (inclusive of abdominal strengthening, pelvic tilts, and hamstring stretching) and core stabilization. A CT scan of lumbar spine at 6 month and 1-year follow-up showed complete healing of the bilateral acute fractures of pars interarticularis at L3 level (Figs. 7 and 8), and the L5 pars were unaltered. The patient was completely pain free and was able to return to football training sessions.

Discussion

Spondylolysis at multiple levels is presumed to result from fatigue fractures, similar to the etiology of single-level pars fracture [14]. Most patients with single-level spondylolysis respond to conservative treatment (which includes a period of rest, with or without bracing, rehabilitation, and return to play when pain free), and only a small percentage require surgery. In contrast, multiple-level pars fractures often require surgery, and conservative measures are rarely useful [10,14]. Developmental spondylolysis do not usually unite, but patients with chronic nonunion of pars fracture can often return to normal physical activities [17].

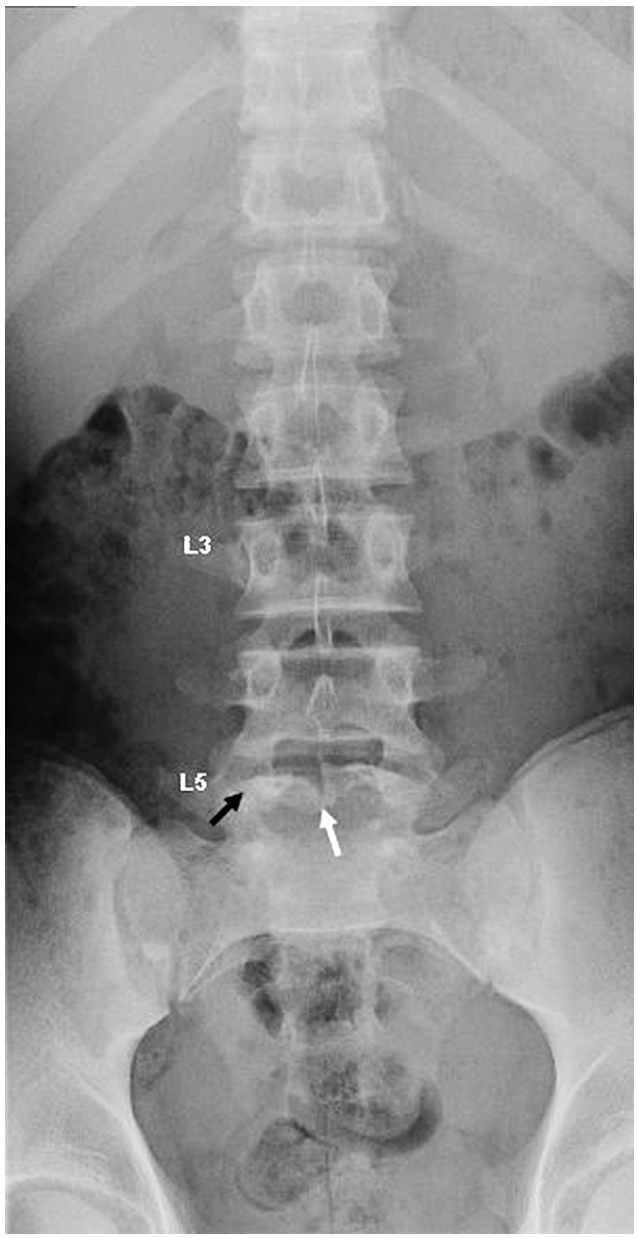

Fig. 1. Anteroposterior lumbar spine X-ray showing pars interarticularis defect (black arrow) and spina bifida occulta (white arrow) at L5.

Plain radiography (lateral/oblique radiograph) is diagnostic for pars lesions; however, it cannot differentiate acute lesions from chronic [14,18]. In unilateral spondylolysis, there is reactive sclerosis of the contralateral pedicle,