

# High-grade spondylolytic spondylolisthesis

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*Case reports of high-grade spondylolisthesis have been rarely published in the chiropractic literature. Documented here is a case involving a 28-year-old woman who presented to the World Spine Care clinic in the Dominican Republic with minimal neuromusculoskeletal symptoms despite a grade 4 spondylolytic spondylolisthesis. The key imaging and etiological features of this clinical disorder are presented.*

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**KEY WORDS:** spondylolisthesis, spondylolysis, pars interarticularis, chiropractic

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### Case Presentation

A 28-year-old female presented to the World Spine Care (WSC) clinic in Moca, Dominican Republic with a 10-year history of intermittent lower back pain (LBP) and

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*Il y a eu peu d'études de cas de spondylolisthésis de haut degré publiées dans la littérature chiropratique. On consigne ici un cas concernant une femme de 28 ans qui s'est présentée à la clinique World Spine Care en République dominicaine avec des symptômes neuro-musculo-squelettiques minimaux malgré un spondylolisthésis spondylolytique de stade 4. Les principales caractéristiques d'imagerie et d'étiologie de ce trouble clinique sont présentées.*

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**MOTS CLÉS :** spondylolisthésis, spondylolyse, isthme interarticulaire vertébral, chiropratique

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parasthesia into the right lower leg and foot. The pain, which was rated as a six out of 10, was described as a “dull ache” and was generally worse when rising from bed first-thing in the morning. Standing up after prolonged

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Consent: The patient has provided written consent to having her personal health information, including diagnostic images, published.

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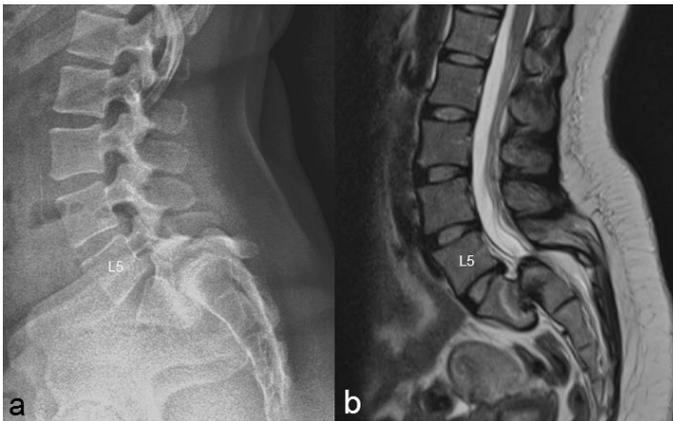


Figure 1. Lateral lumbar radiograph (a) and mid-sagittal T2-weighted magnetic resonance (MR) image (b) reveal six lumbar-type vertebrae. The L6 vertebral body is trapezoidal shaped and has translated 80-90% anteriorly in relation to the S1 vertebral segment. A large gap is present in the region of the L6 pars interarticularis and has resulted in posterior translation of the spinous process and laminae of L6. The L6-S1 disc is obliterated and prominent buttressing of the anterior-inferior aspect of the L6 vertebral body is present. The L5-L6 disc appears well hydrated, but is narrowed and bulging posteriorly. The posterior elements of L5 approximate the posterior aspect of the sacral base resulting in prominent central stenosis at this level.

sitting was also provocative. Exercise at the gym, walking, and performing yoga were described as palliative. Recent diagnostic imaging investigations had revealed a high-grade lumbosacral spondylolisthesis (Figures 1-3). The patient had consulted numerous surgeons and other medical specialists and was told that she would be unable to have children because of her spondylolisthesis and would eventually be confined to a wheelchair if she did not have surgery. There were no signs or symptoms of cauda equina syndrome. The patient was in good general health and did not take medications. Because chiropractic treatment had provided relief in the past, she visited the WSC Moca clinic for a second opinion.

On examination, the patient was of normal weight and her gait was unremarkable. The lumbosacral lordosis was increased. Range of motion of the lumbar spine was full and pain-free, with the exception of mild lower back pain



Figure 2. Anteroposterior lumbopelvic radiograph reveals the characteristic “Bowline of Brailsford” or “Inverted Napoleon Hat” sign. The arrows are pointing to the anterior cortex of the vertebral body and transverse processes of L6. This vertebral body is tipped forward significantly such that it resembles an axial projection.

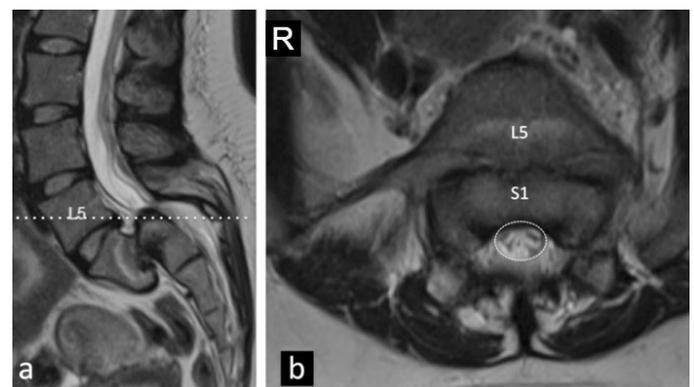


Figure 3. Axial (b) T2-weighted MR image through the lumbosacral region illustrates the relationship between the L5 vertebral body (L5), the sacral base (S1), and the spinal canal and thecal sac (oval). The spinal canal is not significantly narrowed at this level. The sagittal MR image on the left (a) indicates the plane of the axial section depicted on the right (b). Note that the L6 vertebral body is translated anteriorly and inferiorly and is outside the plane of the axial image and therefore does not appear on the axial image.

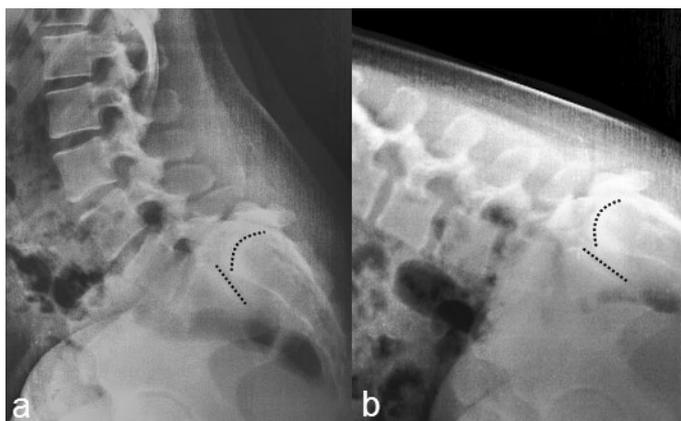


Figure 4. Dynamic lateral lumbar radiographs obtained in partial flexion (a) and full flexion (b). The curved dotted line represents the rounded-off superior surface of the sacral base (the S1 superior vertebral body surface) and the straight dotted line represents the inferior L6 vertebral body endplate surface. The L6 segment translates approximately 5 mm anteriorly and inferiorly in relation to S1 indicative of instability.

on passive end-range extension. Bilateral Kemp's test<sup>1</sup> provoked mild LBP but the straight leg raise, slump, and femoral nerve stretch tests were negative. Neurologic examination of the lower limbs, including motor, reflex, sensory, vibratory, and Romberg's testing, was normal except for absent Achilles tendon reflexes (graded as 0) bilaterally. Mid-thigh and calf muscle circumferences were symmetric bilaterally with no evidence of atrophy. A non-tender midline 'step defect' was palpated at the lumbosacral junction and mild pain was elicited with the application of posterior-to-anterior pressure over this region. Palpation also revealed hypertonicity of the quadratus lumborum and lumbosacral erector spinae muscles, bilaterally. Milgram's test<sup>1</sup> (i.e. bilateral active straight leg raise test, performed with the patient supine) severely provoked the chief LBP complaint and elicited patient apprehension. Further radiographic imaging including dynamic views of the lumbar spine were obtained. The flexion radiographs revealed instability of the spondylolisthesis (Figure 4). Based on clinical and imaging findings, a diagnosis of chronic unstable grade 4 spondylolytic spondylolisthesis was made.

## Discussion

Table 1 lists the radiologic grading and etiological classification systems for spondylolisthesis.<sup>2,3</sup> The key imaging features for high-grade spondylolytic spondylolisthesis are listed in Table 2. According to the Meyerding classification<sup>2</sup>, high-grade spondylolistheses are characterized by an anterior vertebral slippage of 50% or greater (i.e. grades 3, 4, and 5). The incidence of isthmic (spondylolytic) spondylolisthesis in the general adult population ranges between 3.7% and 8%;<sup>9</sup> however, the epidemiology of high-grade spondylolisthesis is unknown. To date, the evidence concerning the long-term prognosis and optimal (i.e. conservative versus surgical) management of patients with high-grade spondylolisthesis also remains insufficient and controversial.<sup>4,9</sup> Moreover, clinical symptoms in such patients often do not correlate with the degree of slip.<sup>10</sup> Several authors advocate for surgical intervention (e.g. fusion, with or without slip reduction) regardless of patient symptoms, in order to prevent further slippage and or symptom progression.<sup>7,8</sup> Others have suggested however that non-surgical management can be considered, particularly in asymptomatic or minimally symptomatic cases.<sup>5-8</sup> Regarding natural history, the risk of slip progression is greater in skeletally immature children and adolescents than it is in adults.<sup>8,10</sup> As such surgery is rarely indicated for this reason in adults.<sup>8</sup>

In the current case, the patient underwent a trial of conservative therapy, including spinal manipulation (to the thoracic and upper lumbar spine), soft-tissue trigger-point therapy and Active Release Techniques<sup>®</sup> (to the lumbosacral and thoracolumbar paraspinous muscles), and home-based spinal stabilization exercises (i.e. cat-camel mobilizations, bird-dogs, side-bridges, and crunches). The patient was also encouraged to continue with her weekly exercise activities (e.g. walking, gym exercise, and yoga). After nine visits (over five weeks) the patient had no functional limitations and her pain severity was reduced to a two out of 10. Furthermore, there were no adverse treatment effects during the course of her care.

Indications for surgery in patients with spondylolisthesis are listed in Table 3. With a greater than 10% reported risk of complications including neurologic injury with surgical intervention<sup>6,8,11</sup>, some authors have indicated that non-surgical treatment may be suitable for patients in the absence of functional limitations or neurologic impairment.<sup>5-8</sup> In the current case, the patient had clinical

**Table 1.**  
*Radiologic grading and etiologic classification systems for spondylolisthesis*

Radiologic (Meyerding <sup>2</sup> ) grading system	
<ul style="list-style-type: none"> <li>• Grade 1 (slippage of 1% to 25%)</li> <li>• Grade 2 (slippage of 26% to 50%)</li> <li>• Grade 3 (slippage of 51% to 75%)</li> <li>• Grade 4 (slippage of 76% to 100%)</li> <li>• Grade 5 (slippage of &gt;100%) (i.e. spondyloptosis)</li> </ul>	
Etiologic (Wiltse <sup>3</sup> ) classification	
• Type 1: Dysplastic	Congenital defect of the neural arch
• Type 2: Isthmic	Pars interarticularis defect (3 subtypes)
	a) Stress (fatigue) fracture (most common type, present in this case)
	b) Elongated pars
	c) Acute pars fracture
• Type 3: Degenerative	Facet joint osteoarthritis
• Type 4: Traumatic	Acute fracture of the vertebral arch other than the pars
• Type 5: Pathological	Insufficiency fracture as a result of bone weakening diseases
• Type 6: Iatrogenic	Fracture secondary to spinal surgery such as laminectomy

and radiologic evidence of instability but no significant functional limitations, postural deformities, gait abnormalities, or progressive neurologic signs or symptoms. Her LBP symptoms also responded favourably to a short-course of conservative treatment. She was advised to return for chiropractic treatment as needed, or for re-evaluation should any neurologic signs or symptoms develop. As the patient was planning on getting married later in the year, the news that her spondylolisthesis would have no bearing on her ability to have children after all came as a welcome surprise.

**Table 2.**  
*Key imaging features of high-grade spondylolytic (isthmic Type 2a) spondylolisthesis*

Key imaging features
<ul style="list-style-type: none"> <li>• Spondylolysis: pars interarticularis stress (fatigue) fracture that usually occurs during childhood or early adolescence</li> <li>• Most common at L5</li> <li>• Anterior displacement of the vertebral body and corresponding posterior displacement of the neural arch resulting in characteristic palpable “step defect” (see Figure 1)</li> <li>• Bowline of Brailsford on frontal radiograph (see Figure 2)</li> <li>• Trapezoidal shape of listhetic vertebral body and corresponding “rounding” of the subjacent sacral base (see Figure 4) (These are signs of chronic, longstanding vertebral body displacement.)</li> <li>• Vertebral body translation &gt;4.5 mm observed on dynamic flexion-extension radiographs suggests radiologic instability (see Figure 4)</li> </ul>

**Table 3.**  
*Indications for surgery in patients with spondylolisthesis*

Surgical indications <sup>8</sup>
<ul style="list-style-type: none"> <li>• Slip progression</li> <li>• High-grade spondylolisthesis with significant lumbosacral kyphotic deformity and sagittal imbalance</li> <li>• Neurologic deficit</li> <li>• Low back pain unresponsive to conservative treatment</li> <li>• Radicular pain and nerve root compression documented on imaging studies unresponsive to conservative treatment</li> </ul>

**Key Messages**

- Published cases involving high-grade spondylolisthesis are rare within the chiropractic literature
- Indications for surgery in such patients include slip progression, significant deformity and postural imbalance, neurologic deficit and/or cauda equina syndrome, and imaging confirmed radiculopathy unresponsive to conservative treatment
- Conservative therapy may be considered as a first line treatment option in patients with high-grade spondylolisthesis who present with minimal neuromusculoskeletal symptoms

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