

## Case Report

# Reduced Lumbar Vertebral Stability and Its Consequences: Osteophyte Formation, Disc Herniation, and Spinal Stenosis

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## Abstract

Reduced stability of the lumbar vertebral body can result in conditions such as lumbar spondylolisthesis, lumbar disc herniation, and lumbar spinal stenosis.

Lumbar vertebral osteophytes: reduced stability of the lumbar vertebral body results in uneven distribution of pressure across the lumbar spine, leading to stress concentration at the edges of the vertebral bodies and the development of lumbar vertebral osteophytes. Furthermore, as individuals age, factors such as lumbar intervertebral disc degeneration and lumbar muscle atrophy can exacerbate the decline in lumbar vertebral body stability. Patients with lumbar vertebral osteophytes may suffer from nerve compression symptoms [1], characterized by lower back pain, limitations in physical activity, and numbness in the lower limbs. The severity of pain tends to escalate with the progression of the condition, potentially culminating in significant walking difficulties in advanced stages.

② Lumbar intervertebral disc herniation: reduced stability of the lumbar vertebral body causes uneven pressure on the lumbar intervertebral discs, predisposing the fibrous annulus prone to rupture. This rupture can subsequently result in lumbar intervertebral disc herniation. Additionally, factors such as lumbar sprain and obesity contribute to the incidence of lumbar disc herniation. Patients with this condition typically present with symptoms like lower backpain, radiating pain in the lower limbs, and intermittent claudication [2]. As the disease progresses, the intensity of pain can escalate, potentially leading to paralysis in severe cases.

③ Lumbar spinal stenosis: reduced stability of lumbar vertebrae can lead to increased pressure within the lumbar spinal canal, resulting in compression of the nerve roots, and the development of lumbar spinal stenosis [3]. Contributing factors may include lumbar vertebral osteophytes and lumbar intervertebral disc herniation.

Patients with lumbar spinal stenosis often exhibit symptoms such as lower back pain, numbness in the lower limbs, and intermittent claudication. The severity of pain tends to increase as the condition advances, with the potential for paralysis in more severe cases.

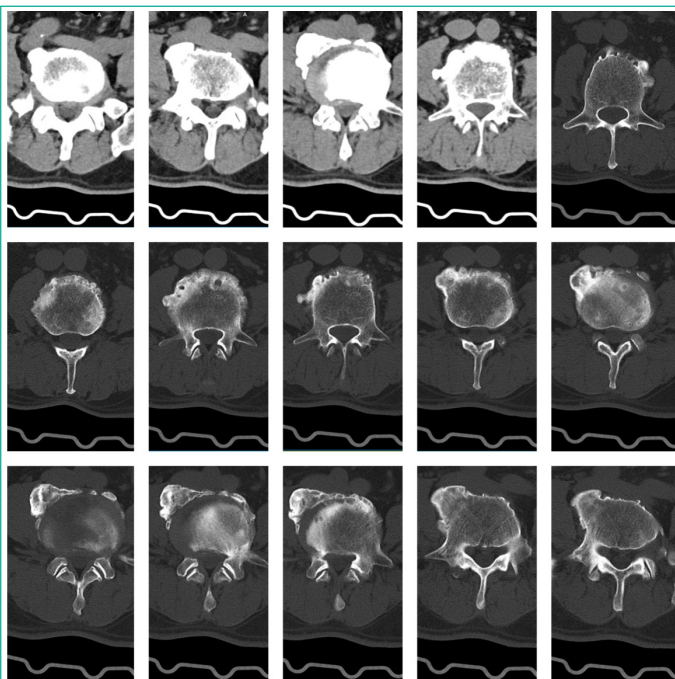
**Keywords:** Decreased stability of lumbar vertebrae; lumbar osteophytes; lumbar disc herniation; lumbar spinal stenosis; surgical treatment

## Introduction

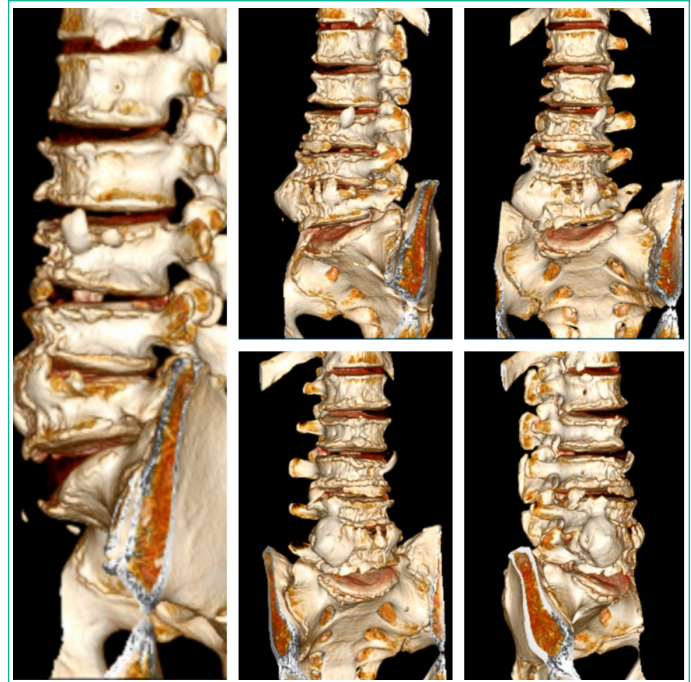
Decreased lumbar vertebral stability refers to the diminished integrity of the lumbar vertebral body and its supporting structures, which impairs the ability to maintain normal anatomical alignment and stability during routine activities. Reduced stability of the lumbar vertebrae is a critical factor contributing to various lumbar spine disorders. Conditions such as lumbar vertebral osteophytes, lumbar intervertebral disc herniation, and lumbar spinal stenosis represent common degenerative lumbar diseases that significantly impact patients' quality of life of patients [4]. Reduced stability can manifest as a range of symptoms, including lower back pain and limited mobility. In severe cases, it may also precipitate complications like lumbar spondylolisthesis.

## Case Report

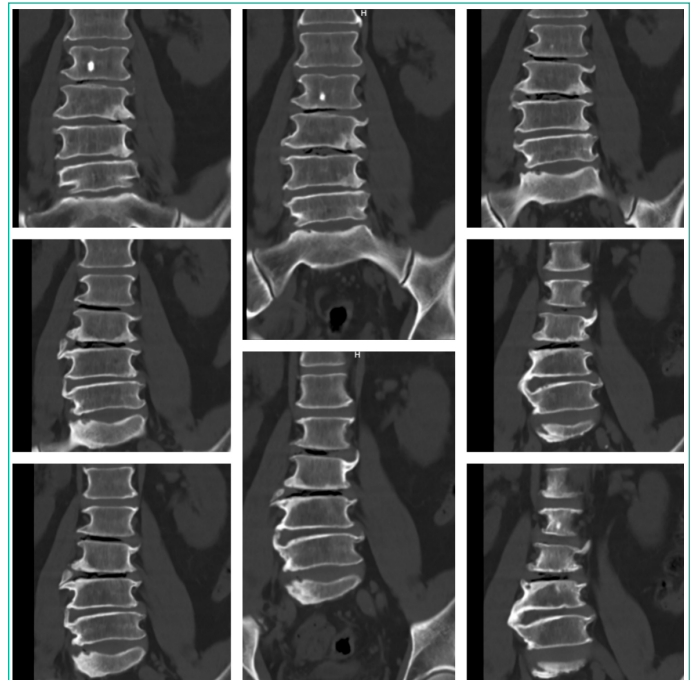
The patient, a 62-year-old male, was hospitalized for 15 days due to complaints of lower back pain, numbness in the lower extremities, and intermittent claudication. Ten years before admission, he had experienced lower back pain and discomfort, which was managed with oral pain medications. Five years prior to admission, he developed lumbar pain with lower limb numbness, which was diagnosed as lumbar disc herniation at a local hospital, and was treated with acupuncture and rehabilitation, resulting in relief. Six months before the current admission, his symptoms intensified, with intermittent claudication limiting his walking distance to no more than 100 meters, prompting him to seek care at our hospital. Physical examination revealed significant tenderness over the lumbar region, marked restriction of lumbar movement, and a positive straight leg raise test at 50° for both lower limbs, along with a positive reinforcement test at 30°. Imaging studies included a lumbar spine CT scan, which showed severe osteophyte formation at the lumbar vertebral bodies (Figure 1). Three-dimensional reconstruction revealed pronounced periarticular osteophytes around lateral displacement of the vertebral bodies (Figure 2). Coronal and sagittal scans depicted numerous bony formations at the vertebral margins, characteristic of the 'bird's beak sign' (Figure 3 & 4). MRI of the lumbar spine indicated degenerative changes, including osteophyte formation, dehydration, and degeneration



**Figure 1:** CT cross-sectional imaging of the lumbar spine revealed severe osteochondral lesions within the lumbar vertebrae.



**Figure 2:** Three-dimensional reconstruction of the lumbar vertebrae demonstrates substantial periarticular bone growth surrounding the lumbar vertebrae, accompanied by lateral displacement of the vertebrae.

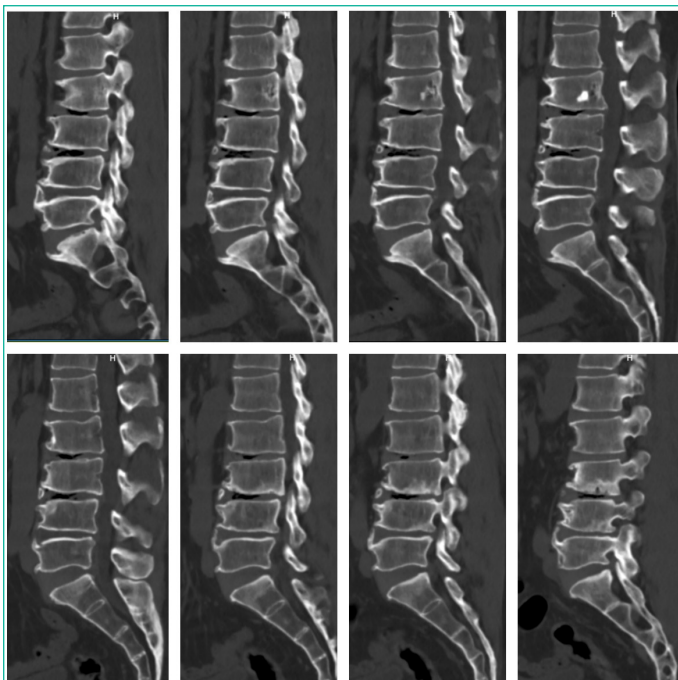


**Figure 3:**

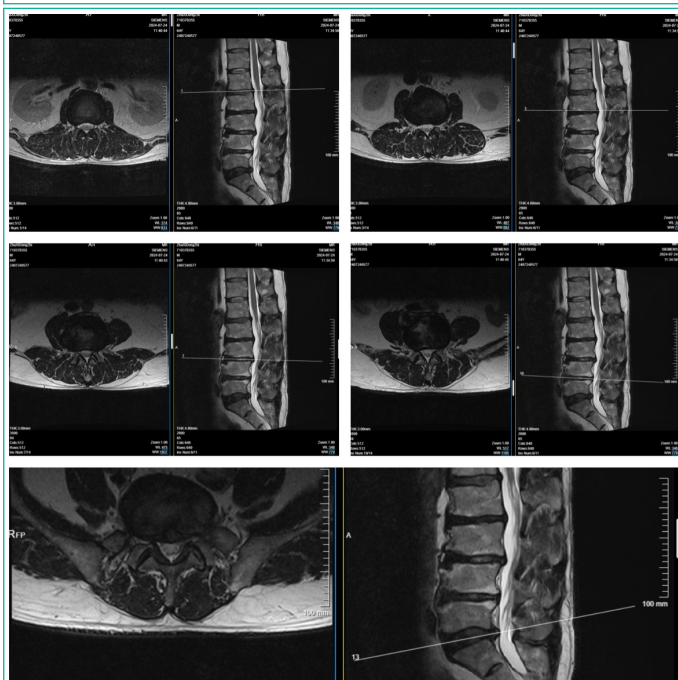
of the intervertebral discs, with herniations noted at L2/3, L3/4, L4/5, and L5/S1 levels. Additionally, there was evidence of lumbar instability and lumbar spinal canal stenosis (Figure 5 & 6).

Upon admission, lumbar spine examination, lumbar spinal canal decompression, removal of lumbar osteophytes, excision of intervertebral discs, lumbar interbody fusion implantation, and implantation of lumbar pedicle screw-rod systems were performed under general anesthesia. Initially, the spinal canal is incised using an ultrasonic bone cutter to sufficiently decompress the canal by removing hyperplastic bony growths. Subsequently, the dura mater is delicately manipulated with a nerve root dissector to delineate and identify the nerve roots and intervertebral discs. With the nerve roots safeguarded, the annulus fibrosus is incised with a scalpel, and the nucleus pulposus is extracted using a nucleus pulposus forceps, which not only removes the nucleus but also the surrounding soft tissues. A fu-





**Figure 4:** CT coronal and sagittal scans of the lumbar spine revealed numerous bony protrusions at the vertebral margins, characteristic of the 'bird's beak sign'

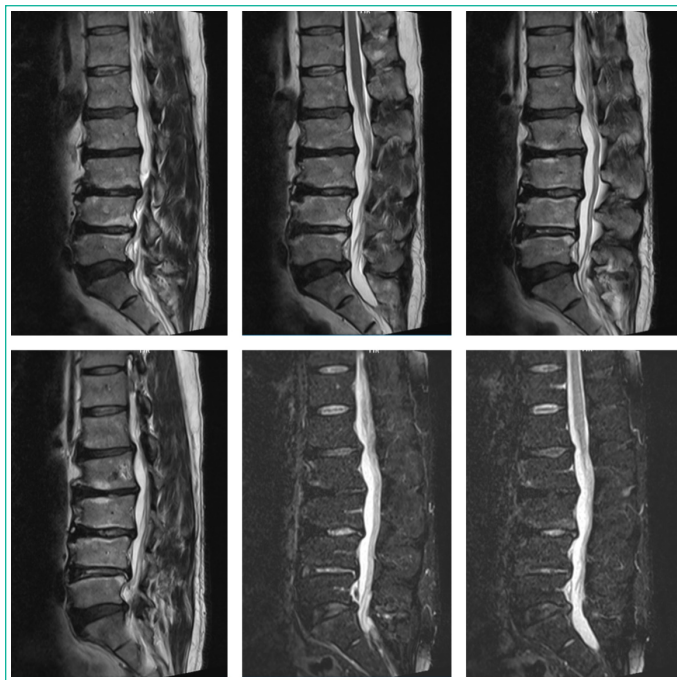


**Figure 5:**

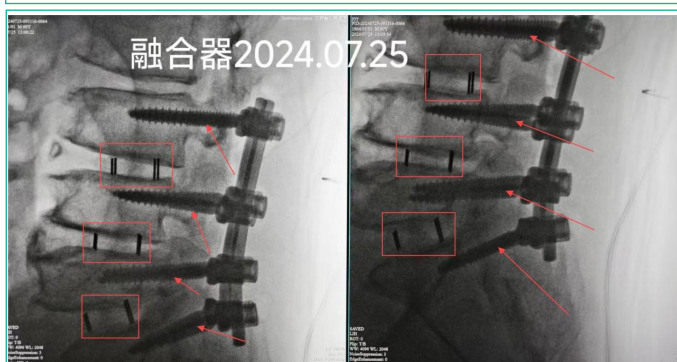
sion implant is then placed within the vertebral space to replace the original intervertebral discs, thereby restoring the stability of the vertebral bodies. To further reinforce the stability of the lumbar spine, pedicle screws and metal rods are implanted. Intraoperative X-ray confirmed the proper positioning of the internal fixation devices (fusion device, pedicle screws, and metal rods) (Figure 7). Upon the patient's recovery from anesthesia, postoperative assessments indicated a significant improvement in the patient's symptoms compared to the preoperative period, demonstrating a favorable surgical outcome. The patient's recovery is being monitored for ongoing progress.

### Discussion

Decreased stability of the lumbar vertebrae is a pivotal factor contributing to conditions such as lumbar spondylolisthesis, lumbar disc herniation, and lumbar spinal stenosis. Prevention and treatment strategies include maintaining proper sitting and



**Figure 6:** Degenerative changes in the lumbar spine, osteophytes, dehydration and degeneration of the intervertebral discs; herniated discs at L2/3, L3/4, L4/5, L5/S1 levels; lumbar instability; lumbar spinal stenosis.



**Figure 7:** Intraoperative X-rays confirmed that the internal fixation devices were properly positioned, including the fusion construct, pedicle screws, and metal rods.

standing postures to prevent lumbar strain, and engaging in lumbar muscle exercises to enhance spinal stability. Conservative treatments, such as traction, physiotherapy, and medication, are appropriate for milder cases. In more severe cases, surgical intervention may be warranted.

### Author Statements

### Conflict of Interest

The authors declare that they have no financial interests or conflicts of interest to disclose in relation to the content of this article.

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