

## Computed Tomography Imaging of Degenerative Disease in the Lumbar Spine

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### Abstract

The degenerative spinal lesions are one of the most frequent causes of lumbar pain syndrome. Diagnosing them is difficult due to poor correlation between radiological data and clinical symptoms. Computed tomography is one of the key modalities in the diagnosis of degenerative disc disease. (**International Journal of Biomedicine. 2019;9(2):182-184.**)

**Key Words:** lumbar spine • degenerative spine • computed tomography • lumbar stenosis.

### Introduction

Osteochondrosis is the most commonly encountered form of degenerative spinal lesion with a primary degeneration of nucleus pulposus as a base. Hyaline plates and adjacent areas of vertebral bodies become injured because of lack of nucleus pulposus elasticity, which leads to fissures and ruptures of the hyaline lamellae (Schmorl's nodes) and the annulus fibrosus (disc protrusions and herniations). Other components of the spinal motion segment (vertebral bodies, ligaments, articulations) eventually get involved in this pathological process, and then osteosclerosis develops in adjacent bone parts and the body height decreases. The articular surfaces become displaced, so the subluxation in facet joints gradually appears, and osteoarthritis develops.<sup>(1,2)</sup>

Degenerative changes finally lead to spinal stenosis with pain syndrome in its debut. There are central and lateral

(foraminal) forms of spinal stenosis: relative – over 12 mm and absolute – under 12 mm. Many researchers describe the incompatibility between the imaging and clinical signs. In cases of relative stenosis there are no clinical findings, but minimal intervertebral protrusion could produce significant pain with myelopathy.<sup>(3)</sup>

Spinal computed tomography (CT) can provide assessment of details of the configuration of the bone canal's walls; can prove the fact of presence of disc herniation; and can define its dimensions, the diameter of vertebral and foraminal canals.<sup>(4)</sup> The cause of the lumbar canal's stenosis in most patients with degenerative spinal disease is the segmental degenerative instability related to intervertebral destruction.<sup>(5)</sup>

### Materials and Methods

Fifty patients had lumbar spine CT (Toshiba Aquilion One 64) studies at the Radiology Department of Road Clinical Hospital in the period from August 2018 to February 2019. All patients (mean age of 48±12.0 years), predominantly able-bodied men between 40 and 59 years of age, had chronic lumbar pain and neurogenic intermittent claudication.

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## Results and Discussion

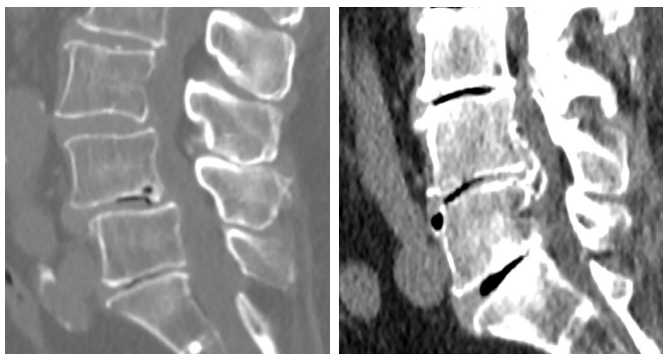
All 50 patients with neurological symptoms of osteochondrosis had degenerative spinal CT changes (Table 1).

**Table 1.**

*CT signs of osteochondrosis in the lumbar spine*

Pathological process	Patients	
	n	%
Spondylosis	38	76
Spondyloarthrosis	33	66
Dystrophic stenosis of vertebral canal	4	8
Spondylolisthesis	3	6
Osteophyte in vertebral canal	5	10
Hypertrophy of facet joint	3	6

CT showed a decrease in the intervertebral disc height, a vacuum phenomenon, a disc protrusion, a lordosis alignment, a vertebral displacement (Fig.1), an ossification of posterior longitudinal ligament (Fig.2), and a subchondral osteosclerosis.



**Fig. 1.** CT, sagittal view.

Spondylolisthesis at the L3–L4 level, grade 1.

**Fig. 2.** CT, sagittal view.

Ossification of posterior longitudinal ligament at the L4–L5 level.

The Schmorl's nodes were visualized in 75% of patients as an intracorporeal intrusion of discs with a hyperdense rim. Osteoarthrosis often induces a decrease of lateral recess (average diameter >5 mm). Further progression of degenerative process leads to load increase to facet joints with their deformation. The main radiological signs of spondyloarthrosis were a decrease of the articular space height, subchondral epiphyseal osteosclerosis, formation of osteophytes, the vacuum phenomenon and subchondral cysts (Fig.3).



**Fig. 3.** CT, axial view.

Facet joints arthrosis.

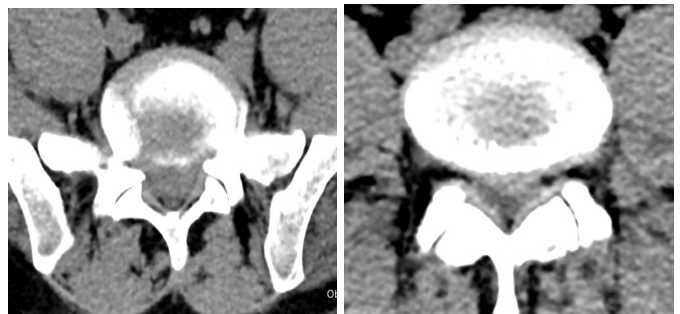
The herniation level was assessed on the axial and sagittal views; we took such a horizontal disc deformation when the diameter of herniation exceeded its width because CT could not show the continuity of the annulus fibrosus under the herniated disc. The dimensions and the localization of disc herniations are demonstrated (Table 2).

**Table 2.**

*A frequency of different forms of disc herniations in the lumbar spine*

The forms of disc herniations	Number (n=20)	
	n	%
Median	3	15
Paramedian	7	35
Posterolateral	4	20
Foraminal	3	15
Sequestered	3	15

The disc herniations were visualized in 20(40%) patients, 4(8%) of them had 2 herniated discs (Fig.4). The majority of disc herniations were between 5 mm and 8 mm in size (75.5%), of paramedian form (35%), and occurred at L4–L5 and L5–S1 levels (Fig.5). There were sequestered discs in 3(15%) patients.



**Fig. 4.** CT, sagittal and axial views. The disc herniations at L4–L5, L5–S1, spondylolisthesis L5.

CT showed stenosis of the spinal canal in 19(38%) patients, 15–18 mm in its sagittal diameter. The causes of spinal stenosis were the posterior and posterolateral osteophytes, spondylarthrosis, spondylolisthesis, ossification of posterior longitudinal ligaments, and hypertrophy of ligamentum flavum (>5 mm).

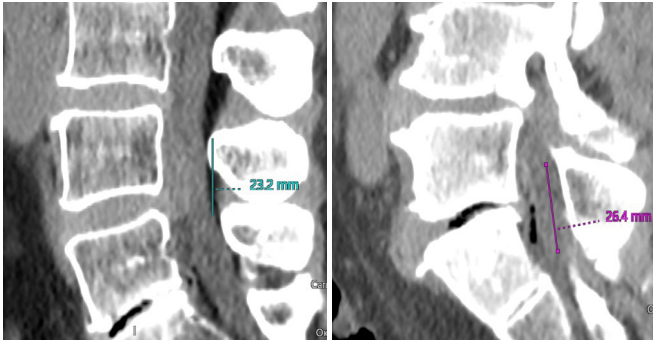


Fig. 5. CT, sagittal view. The sequestered disc herniations.

## Conclusion

Thus, degenerative spinal lesions are one of the most frequent causes of lumbar pain syndrome. Diagnosing them is difficult due to poor correlation between radiological data and clinical symptoms. CT is one of the key modalities in the diagnosis of degenerative disc disease; it permits us to visualize the signs of spinal stenosis. Therefore, CT should be performed on patients with chronic lumbar pain and neurogenic intermittent claudication.

## Competing Interests

The authors declare that they have no competing interests.

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