



MRI Evaluation of Lumbar Disc Degenerative Disease

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Abstract

Aims and objectives: To evaluate the characterization, extent and changes associated with the degenerative lumbar disc disease by Magnetic Resonance Imaging.

Materials and Methods: This is an observational prospective study of 75 patients of lumbar disc degeneration with age group between 20 to 69 years were diagnosed and studied on 1.5 Tesla siemens MRI machine. MRI findings like disc desiccation, disc herniation, spinal canal narrowing, neural foraminal narrowing, nerve root compression, ligamentum flavum hypertrophy, facet arthropathy were observed.

Result: The commonest age group affected by lumbar degenerative disc disease is 50 – 60 years. Males are commonly affected. Multiple disc involvement is more common than single disc involvement in degenerative disc disease. Most common level being involved is L4-L5 followed by L5-S1. Disc desiccation is the frequent finding in degenerative disc disease. Diffuse disc bulge is the commonest type of disc herniation seen on MRI, followed by disc protrusion and extrusion. The most common location of herniated disc is postero-lateral followed by postero-central. Sciatica is common in patients with neural foraminal narrowing.

Conclusion: Lumbar disc degeneration is the most common cause of low back ache. In the initial assessment of patients with low back pain, the plain film radiography is useful. MRI is the most important imaging technology in diagnosis of disc pathology and precise localisation of intervertebral disc changes due to its advantage of multiplanar imaging, excellent soft tissue contrast with lack of radiation.

Keywords: Disc degenerative disease, MRI lumbosacral spine

Introduction

Low back ache is the most common patient complaints reported in clinical practice. The most common cause of low backache is lumbar degenerative disc disease. Imaging techniques are often essential in making the correct diagnosis for prompt management. Plain Radiography though remain a first imaging modality, magnetic resonance imaging (MRI) due to its inherent soft tissue contrast resolution and lack of ionizing radiation remains invaluable modality in the evaluation of low back ache. MRI lumbosacral spine demonstrates the lumbar spine in multiple planes and extradural soft tissues including intervertebral discs, the exiting

nerve roots and intra dural structures including the spinal cord, conus medullaris & intrathecal roots. MRI provides thorough details about all these as compared to CT with or without intrathecal contrast agents or myelography.

MATERIALS AND METHODS:

This is an observational prospective study. The study population included 75 patients with age group between 20 to 69 years who underwent MRI lumbosacral spine imaging in Rajah Muthiah Medical College & Hospital for non traumatic causes of low back ache. The imaging was done on the advice of

referring doctor and no patient was made to undergo MRI for the sole purpose of this study

CASE 1, 37 years old female:



Sagittal T2 weighted image showing disc desiccation changes with disc herniation at multiple discal levels.



Axial T2 weighted image at L2-L3 discal level showing left paracentral disc protrusion with left neural foraminal narrowing and left exiting nerve root compression.

CASE 2, 40 years old female:



Axial T2 weighted image showing diffuse disc bulge at L4-L5 discal level causing mild spinal canal and B/L neural foraminal narrowing.

CASE 3, 79 years old male:

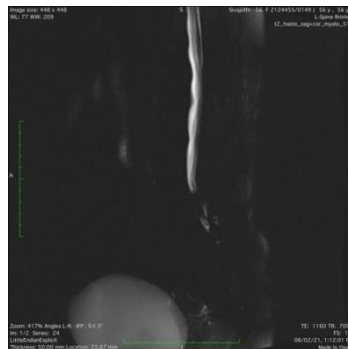


Sagittal and Axial T2 weighted images at L4-L5 discal level showing left paracentral disc extrusion with left neural foraminal narrowing and left exiting nerve root compression.

CASE 4, 56 years old female:

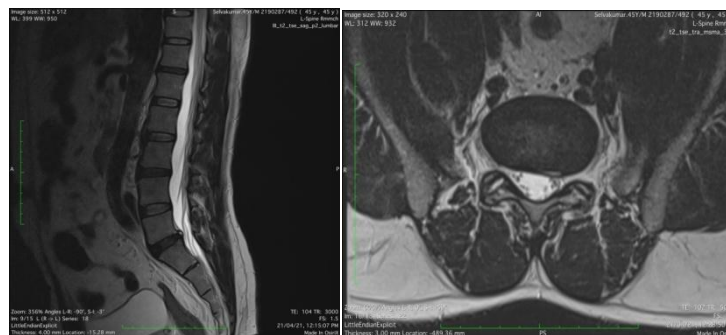


Axial T2 weighted image at L4-L5 discal level showing diffuse disc bulge with B/L ligamentum flavum hypertrophy causing severe spinal canal narrowing and cauda equina nerve roots compression.



Myelogram showing cauda equine nerve roots compression at L4-L5 discal level.

CASE 5, 45 years old male:



Sagittal and axial T2 weighted images showing diffuse asymmetric disc bulge with left postero-lateral annular tear at L5-S1 discal level causing mild left lateral recess narrowing.

CASE 6, 54 years old male:



MRI lumbosacral spine lateral view showing anterior osteophytes, vertebral end plates irregularity and disc desiccation changes with diffuse disc bulge at multiple lumbar levels. S/O Degenerative changes.

CASE 7, 38 years old female:



Sagittal T1 and T2 weighted images showing type 2 Modic end plate changes at L5 – S1 level [high signal on T1 & T2] and diffuse disc bulge.

CASE 8, 55 years old male:

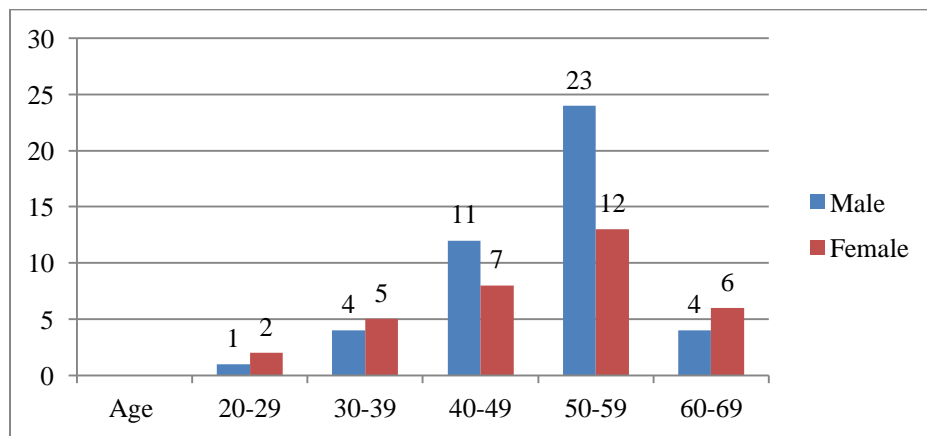


X-Ray and MRI lumbosacral spine showing schormls nodes at end plates of multiple lumbar vertebra.

RESULTS:

Table – 1: Demographic study group distribution

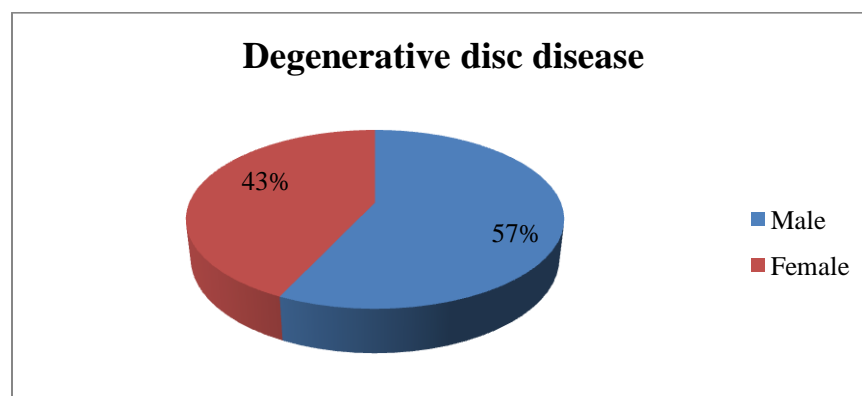
Gender \ Age	Male	Female	Total
20-29	1	2	3
30-39	4	5	9
40-49	11	7	18
50-59	23	12	35
60-69	4	6	10
Total	43	32	75



Age distribution shows that most common age group in degenerative disc disease is 50-59 years (46.8%) followed by 40-49 years (25.3%).

Table -2: Sex wise distribution

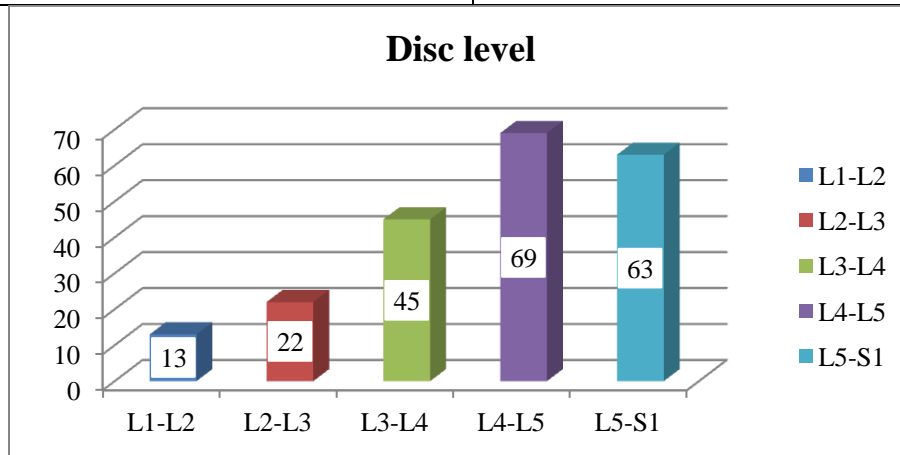
Sex	Number
Male	43 (57%)
Female	32 (43%)



Sex distribution shows that, males affected more than females in degenerative disc disease. Male to Female ratio - 1.3 : 1

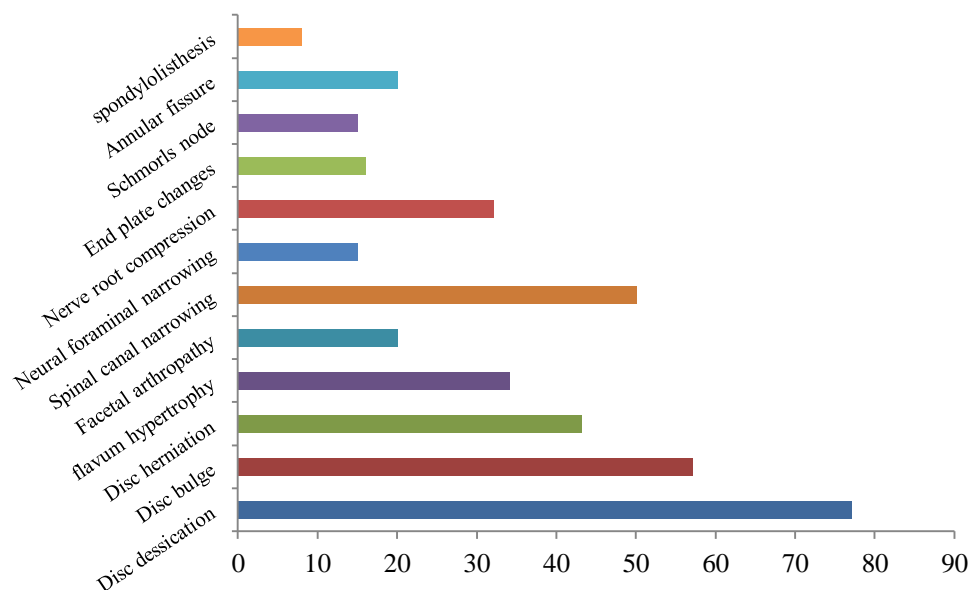
Table-3: Distribution according to disc level

Disc level	Number
L1-L2	13
L2-L3	22
L3-L4	45
L4-L5	69
L5-S1	63



Study shows that degenerative disc occurs most commonly at L4-L5 level (87%) followed by L5-S1 level (79.75%).

Table – 4: MRI findings in degenerative disc disease

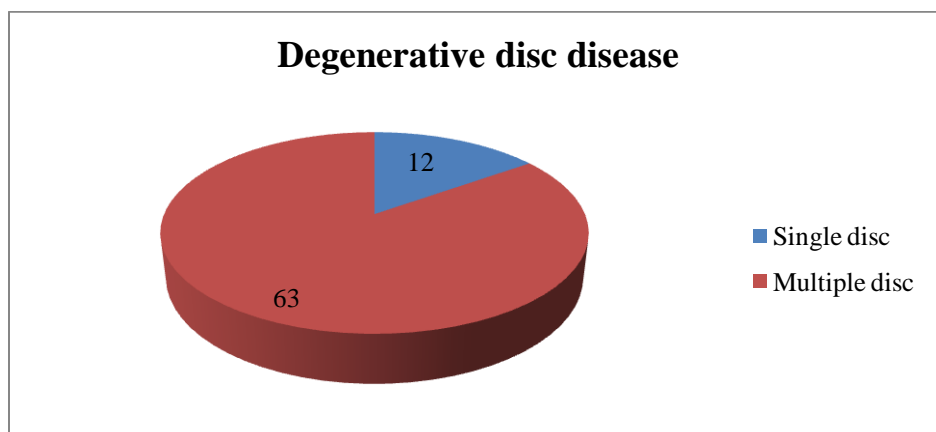


Disc desiccation was the most frequent finding observed in 73 (97.5%) patients, followed by disc bulge (72%), spinal canal narrowing (63%) and disc herniation (54.4%).

Other findings include neural foraminal narrowing (18.9%), nerve root compression (40%), ligamentum flavum hypertrophy (43%), facet arthropathy (25.3%) and spondylolisthesis (10.1%). Other miscellaneous findings include annular fissure (25.3%), schmorl's node (18.9%) and modic end plate changes (20.2%).

Table – 5: Single vs multiple disc abnormalities

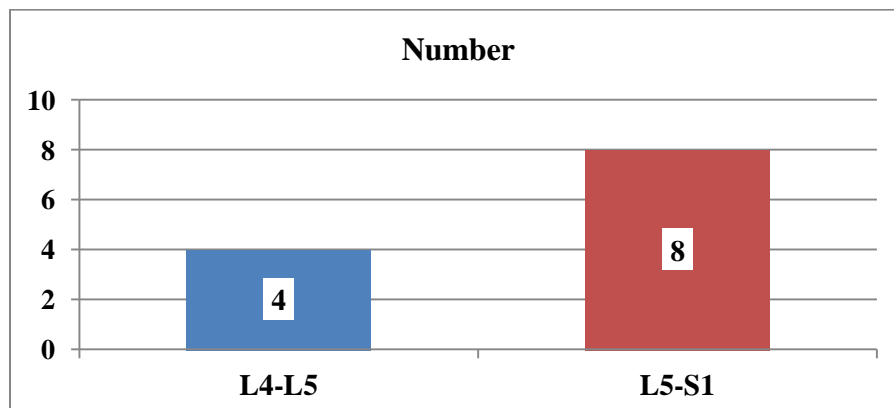
Degenerative disc disease	Number
Single disc abnormalities	12
Multiple disc abnormalities	63
Total	75



Study shows that multiple disc involvement is more common than single disc involvement in degenerative disc disease.

Table – 6: Single disc abnormalities [Degenerative disc disease]

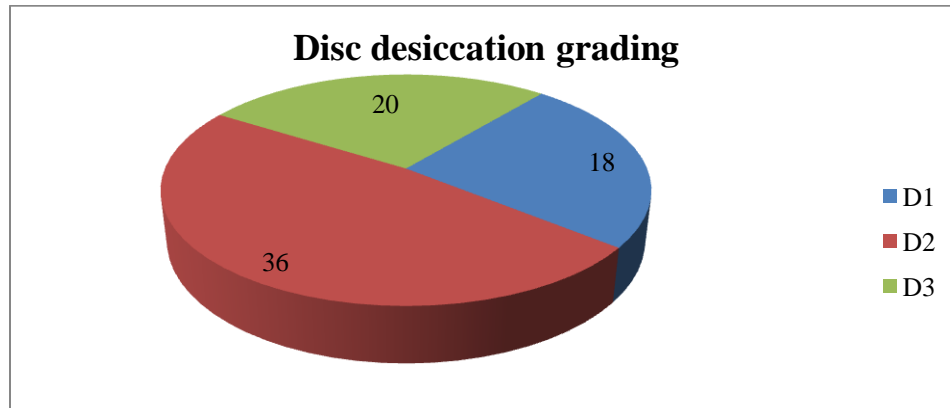
Disc level	Number
L4-L5	4
L5-S1	8



Among single disc involvement, L4-L5 is more commonly affected, followed by L5-S1.

Table – 7: Disc desiccation grading

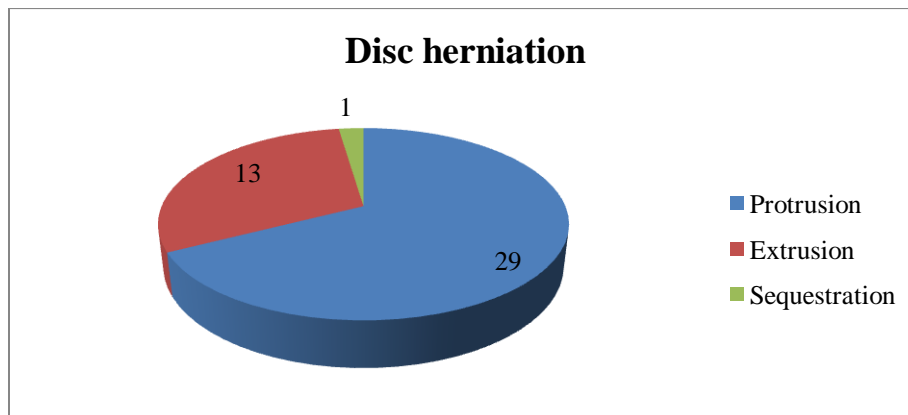
Disc desiccation	Number	Percentage (%)
Grade 1	18	24.7
Grade 2	36	48
Grade 3	20	27.3
Total	74	100



Study shows that disc desiccation is the most common MRI finding in degenerative disc disease (97.5%), of which grade 1 seen in 24.7 % of cases, grade 2 seen in 48% of cases and grade 3 in 27.3% of cases.

Table – 8: Disc herniation types

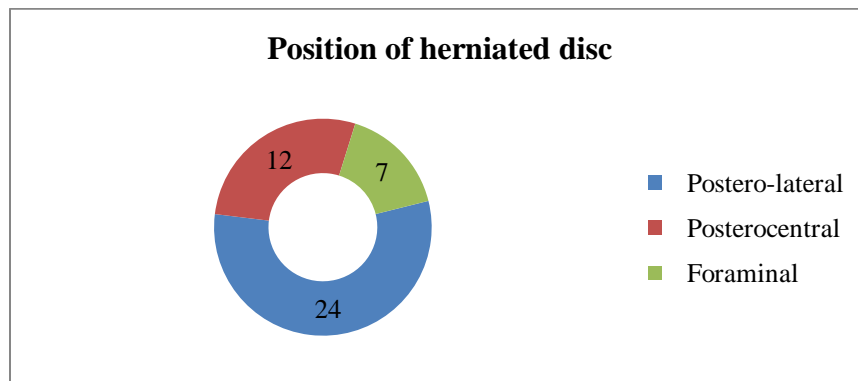
Disc herniation types	Number	Percentage [%]
Protrusion	29	67.4
Extrusion	13	30.2
Sequestration	1	2.3
Total	43	100



Study shows that, the most common type of disc herniation is protrusion (67.4%) followed by extrusion (30.2%).

Table – 9: Position of herniated disc

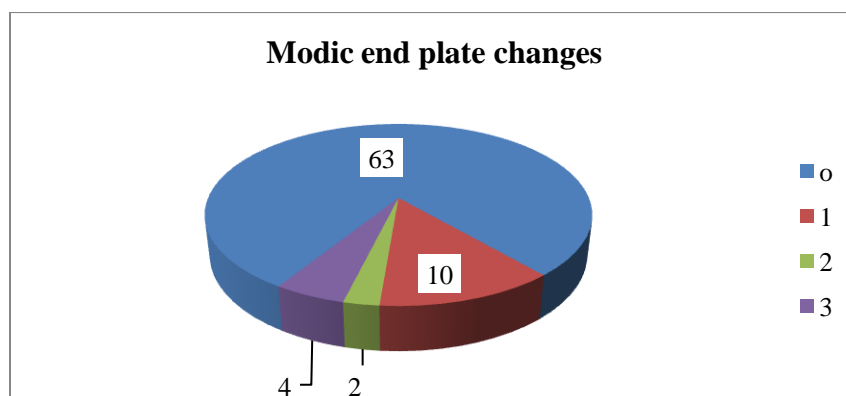
Position of herniated disc	Number
Postero-lateral	24
Posterocentral	12
Foraminal	7
Total	43



Study shows that, the most common location of herniated disc is postero-lateral (55.8%) followed by postero-central (27.9%).

Table – 10: Modic end plate changes

Modic end plate changes	Number
Type 1	10
Type 2	2
Type 3	4
Total	16



In the study group, majority doesn't had modic end plate changes (79.7%). Out of 16 cases, grade 1 seen in 10 patients (12.6%), grade 2 seen in 2 patients (2.5%) and grade 3 seen in 4 patients (5%).

DISCUSSION:

Disc desiccation: Disc desiccation (also known as disc dehydration) is most common degenerative change of intervertebral discs¹.

Disc bulge: A disc bulge occurs when the outer fibres of the annulus fibrosus of an intervertebral disc are displaced beyond the borders of adjacent vertebral bodies by more than one-quarter (25 percent or 90 degrees) of the circumference of the disc².

Disc Protrusion: The distance between the edges of the disc herniation is less than the distance between the edges of the base.

Disc Extrusion: The distance between the edges of the disc herniation is more than the distance between the edges of the base.

Position of herniated disc: Central, Para central / lateral recess, Foraminal and Far lateral / extraforaminal.

Annular fissure: Annular fissures are separations between annular fibres that appear on T2W imaging as high intensity zones representing fluid or granulation tissue³.

Modic endplate changes: Degenerative and inflammatory alterations involving the vertebral endplates and adjacent vertebral bodies as observed on MRI³

Modic type I represents bone marrow edema and inflammation

T1: low signal, **T2:** high signal

Modic type II represents yellow fatty marrow

T1: high signal, **T2:** iso to high signal

Modic type III represents subchondral bony sclerosis

T1: low signal, **T2:** low signal

Schmorl's nodes: protrusions of the cartilage of the intervertebral disc through the vertebral body endplate and into the adjacent vertebra⁴.

Facet joint arthropathy: It occurs from facet joint chondral loss, osteophyte formation and hypertrophy of the articular processes that may cause spinal canal stenosis in severe cases. Imaging shows subchondral sclerosis / erosions, bone odema and facet joint effusion.⁵

CONCLUSION:

Lumbar disc degenerative disease is the most common cause of low back ache. MRI is the standard imaging modality for detecting disc pathology due to its advantage of lack of radiation, multiplant imaging capability, excellent spinal soft-tissue contrast and precise localization of intervertebral disc changes.

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