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Original Research Article

Title: To diagnose and characterize various discal spinal pathology on MRI

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Abstract

Background & Methods: The aim of the study is to diagnose and characterize various discal spinal pathology on MRI. Imaging of lumbar spine was performed in all three standard planes (axial, sagittal and coronal) .The field of view varied between 15 and 30cm depending on patient´s size.

Results: Paracentral: The most frequently observed location, with 24 discs affected (37.6%). This area is just off-center and is a common site for herniations that may impinge on nerve roots. Central: Involved in 20 discs (31.2%). These herniations occur in the midline and may compress the thecal sac or spinal cord (in the upper spine). Foraminal: Found in 15 discs (23.4%). These are located in the neural foramen, where nerve roots exit the spinal column, and can cause radicular symptoms. Extraforaminal: The least common, with 5 discs (7.8%). These occur lateral to the foramen and are less frequent but can still affect exiting nerve roots.

Conclusion: The majority of patients presenting with intervertebral disc pathologies of lumbar spine were in the sixth decades. Most of the patients were males. Most common clinical presentation was low back pain radiating to unilateral lower limb. Of all lumbar disc levels, involvement of L4-L5 disc level was the most common followed by L5-S1 disc level. In degenerative disc disease, disc bulge was most common followed by disc herniation. Broad based disc herniation was more common than focal protusion. Most of the disc herniation was paracenteral type. MRI is a useful non-invasive modality having high diagnostic accuracy in the diagnosis of intervertebral disc pathologies.

Keywords: diagnose, discal, spinal, pathology & MRI.

Study Design: Observational Study.

Introduction

The spinal column is a complex anatomical structure which is composed of vertebrae, intervertebral discs and ligaments. All these components undergo degenerative changes and morphologic alterations during life[1]. The intervertebral discs constitute the

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principal connections between the vertebrae and have two main functions to serve as shock absorbers and to allow movement of the spinal column.

Computed tomography (CT) is imaging method of choice for evaluation of bony details. Secondary signs of degeneration reliably detected with CT i. e. calcification, the vacuum phenomenon, sclerosis of the adjacent intervertebral body. CT represented a major advance in the evaluation of disc diseases, distinguishing soft tissues from bone changes[2]. CT with adjuvant myelography can demonstrate the thecal sac, the spinal cord, and the exiting nerve roots, and their possible compromise by disc bulging, herniation and spinal stenosis. But it is relatively insensitive to the early phases of degenerative process in the disc especially when the configuration of the disc itself has not altered and it is not good for exact measurement of theacal sac or nerve root compression, that information is critical for the management of the patient[3].

The intervertebral disc is a complex structure consisting of several highly specialized connective tissues. A combination of hyaline cartilage, fibrocartilage, mucopolysaccharide, and dense collagenous fibrous tissue gives the discs the properties that confer flexibility and stability to the spine[4]. The disc structure is usually described in terms three components: the cartilaginous endplate, nucleus pulposus, and annulus fibrosus.

The cartilaginous endplate is a layer of hyaline cartilage that covers most of the vertebral endplate, surrounding the cartilaginous endplate is a ring of dense bone the ring apophysis-that fuses to the vertebra in the second decade of life[5-6]. The cartilaginous endplate attaches firmly to the osseous endplate by means of numerous collagenous fibers and strengthens the osseous endplate, which contains multiple perforations.

Material and Methods

This prospective study was done in the Radio diagnosis Department of Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh, India for 01 Year. A total of 100 patients, who were referred to our department with clinical suspicion of discogenic pathologies, underwent magnetic resonance imaging evaluation of lumbar spine. The patients were briefed about procedure. The noise due to gradient coils and the need to restrict body movements during the scan time was explained to the patient. Patient is placed in supine position. Body coil was used for imaging of the lumbar regions.

Inclusion criteria

1. Patients referred to our department with strong clinical suspicion of discogenic pathologies.

Exclusion criteria

1. Patients having non discogenic spinal pathologies
2. Patients with ferromagnetic implants, pacemakers, and aneurysm clips.

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Result

Table No. 1: SEX DISTRIBUTION OF CASES

S. No.	SEX	NO OF CASES	% OF CASES
1.	MALE	63	63%
2.	FEMALE	37	37%
	TOTAL	100	100%

Table No. 2: PRESENTING COMPLAINTS

S No.	COMPLAINTS	NO OF CASES	% OF CASES
1.	Low back pain non-radiating	28	28%
2.	Low back pain radiating to single lower limb	41	41%
3.	Low back pain radiating to both lower limb	29	29%
4.	Neurological deficit	12	12%
5.	Others	06	6%

Table No. 3: LEVEL OF CONGENITAL LESIONS

S No.	LEVEL	NO. OF CASES	% OF CASES
1.	L1-2	00	00%
2.	L2-3	00	00%
3.	L3-4	00	00%
4.	L4-5	01	11%
5.	L5-S1	08	89%
	TOTAL	09	100%

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The distribution of 9 cases across different spinal levels, from L1-2 to L5-S1. Here's a description of the data:

L1-2, L2-3, and L3-4: These upper lumbar levels had no reported cases (0 cases, 0%).

L4-5: This level had 1 case, accounting for 11% of the total.

L5-S1: The majority of cases (8 out of 9) occurred at this level, representing 89% of the total.

Table No. 4: LESIONS OF DEGENERATIVE DISC

S No.	TYPE	NO. OF DISCS	% OF DISCS
1.	DISC BULGE	49	49%
2.	DISC HERNIATION – BROAD BASED	21	21%
3.	FOCAL PROTRUSION	17	17%
4.	EXTRUSION	10	10%
5.	SEQUESTRATION	03	06%
	TOTAL	100	100%

The distribution of 100 intervertebral disc pathologies categorized by type. Each type is listed with its corresponding number of affected discs and percentage of the total. Here's a detailed description:

Disc Bulge: The most common finding, observed in 49 discs, accounting for 49% of all cases. This suggests a generalized outward expansion of the disc.

Disc Herniation – Broad Based: Found in 21 discs (21%). This type of herniation involves a more extensive area of the disc circumference.

Focal Protrusion: Seen in 17 discs (17%). This is a localized disc displacement, usually involving a smaller portion of the disc.

Extrusion: Identified in 10 discs, comprising 10% of the total. This indicates a more severe disc herniation where the nucleus pulposus breaks through the annulus fibrosus.

Sequestration: The least common, with 3 discs affected (6%). This severe condition involves a free fragment of disc material separated from the main disc.

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Table 5: TYPES OF FOCAL DISC PROTRUSION

S. No.	TYPES	NO. OF DISCS	% OF DISCS
1.	CENTRAL	20	31.2%
2.	PARACENTRAL	24	37.6%
3.	FORAMINAL	15	23.4%
4.	EXTRAFORAMINAL	05	7.8%
	TOTAL	64	100%

The distribution of 64 intervertebral disc pathologies based on their anatomical location (type of disc displacement). Each category includes the number of discs involved and the percentage of the total. Here's a detailed description:

Paracentral: The most frequently observed location, with 24 discs affected (37.6%). This area is just off-center and is a common site for herniations that may impinge on nerve roots.

Central: Involved in 20 discs (31.2%). These herniations occur in the midline and may compress the thecal sac or spinal cord (in the upper spine).

Foraminal: Found in 15 discs (23.4%). These are located in the neural foramen, where nerve roots exit the spinal column, and can cause radicular symptoms.

Extraforaminal: The least common, with 5 discs (7.8%). These occur lateral to the foramen and are less frequent but can still affect exiting nerve roots.

Discussion

Magnetic resonance imaging has emerged as the frontline investigation for evaluation of spine and intervertebral disc. It is noninvasive, does not involve ionizing radiation and has multiplanar capability with excellent soft tissue demonstration[7]. MRI provides exact information regarding type of disc pathologies, cord or nerve root compression. It also provides accurate information about associated pathologies that can be responsible for patient symptoms even without disc pathologies. It is highly accurate in differentiation of degenerative disc pathologies with other pathologies i.e. inflammatory or neoplastic. It is a very good modality for imaging of post op patients. MRI is an accurate diagnostic method, enough to lead to decisions for conservative treatment and provides all information's of spine, disc, cord and nerve roots which are essential before surgery. So it can affect treatment pathway of disc diseases in a critical way[8].

Among the 500 discs studied by us, the degenerative disc disease constituted the largest chunk of the pathology occupying 81.2% of the total discs[9]. This was followed only by

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normal discs which constituted around 12%. The degenerative disc pathologies were the most common in the study by P. Kjaer et al where they formed 86.7% of the cases.

Degenerative lesions formed the most common pathology encountered by us in this study. Among the various grades of degeneration of disc encountered, Type 4 constituted the maximum number of cases with 35%[10]. The second commonest grade of degeneration of the disc was Type 5 with 29% disc involvement followed by Type 3 degenerated discs. P. Kjaer et al, Jeffrey J. Jarvik also found that in their study type 4 and type 5 grade of degenerative discs constituted 61% of the total cases.

Disc bulge constituted the maximum number of cases involving 44.6% of the studied discs[11]. The second commonest lesion that was encountered was broad based disc herniation occurring in 16.4% of the discs. Boos et al also found that disc bulge is the commonest of degenerative lesions that are found constituting 51% of the lesions followed by broad based disc herniation. Similar findings are also seen in P. Kjaer et al.

Conclusion

The majority of patients presenting with intervertebral disc pathologies of lumbar spine were in the sixth decades. Most of the patients were males. Most common clinical presentation was low back pain radiating to unilateral lower limb. Of all lumbar disc levels, involvement of L4-L5 disc level was the most common followed by L5-S1 disc level. In degenerative disc disease, disc bulge was most common followed by disc herniation. Broad based disc herniation was more common than focal protusion. Most of the disc herniation was paracenteral type. MRI is a useful non-invasive modality having high diagnostic accuracy in the diagnosis of intervertebral disc pathologies.

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