Research Article

Role of MRI in lumbar intervertebral disc prolapse - a clinico- radiologic correlation study

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Abstract

Objective: To describe degenerative changes involving intervertebral discs of lumbar spine in correlation with symptoms of the patients. **Materials and Methods:** Patients with clinically suspected lumbar intervertebral disc prolapse referred for MRI to the Radiology Dept. of our institution over a period of one year from Jan 2013 to Jan 2018 were included in the study. This retrospective analytical study included 100 patients who presented with low back and/or radiating leg pain and other symptoms suggestive of intervertebral disc prolapse. All the patients have undergone MRI on 1.5 T MRI (Philips Achieva 16 Ch.) scanner. The images were correlated with clinical symptoms and level of disc prolapse as well as neurological signs and symptoms. Statistical analysis included percentage frequency and chi square test. **Results:** 100 patients were included in the study with age ranging from 18 to 73. Disc bulge was most frequent finding seen in 74 patients (74%), disc herniation was seen in 25 patients (25%) and was commonest in patient with acute history of backache while disc bulge was common in patients with chronic symptoms. 77 patients (77%) had MR evidence of nerve or thecal compression. Nerve compression (P Value= 0.013) and disc herniation (P value= 0.004) were significantly associated with pain distal to the knees. **Conclusion:** Nerve compression or Disc herniation was strongly associated with distal leg pain. Nerve compressions were commonest in patients presenting with acute onset of backache. Disc bulge/ degeneration showed no significant association with specific pain patterns.
Key Words: Disc bulge, Disc Herniation, Nerve compression, Lumbar Spine.

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INTRODUCTION

In the working age population back pain secondary to degenerative changes of the spine is one of the leading causes of disability.[1] Nearly 80% of all adults experience low back pain at some point of time in their lives. Degenerative changes involving the intervertebral disc complex is a consequence of variety of environmental factors as well as from normal aging.[2] Degenerative spinal stenosis can be of bony origin (spondylolisthesis, spondylosis, osteophytosis and hypertrophy of facetal joint), ligamentous origin especially ligamentum flavum or from intervertebral disc origin (disc bulge and herniation).[3] Majority are due to a combination of bone, ligament, and disc disease.[4] The most common site of involvement is the lumbar spine followed by cervical spine.[5] With advancements in MRI, the dependence on CT scan/myelography for evaluation of pathology and degenerative changes of the spine drastically reduced over the years. MRI is the imaging modality of choice for evaluation of lumbar spine degeneration.[6,7] MRI provides excellent multiplanar capabilities and high soft tissue contrast resolution leading to superior delineation of disk, nerve, fat, ligament, CSF and bone.[8] It is the ideal tool for evaluating the extent of disc disease such as (a) Disc bulge: circumferential symmetrical disc extension beyond the interspace), (b) Disc protrusion: focal or asymmetrical disc extension beyond the interspace with base against the parent disc broader than any other diameter of protrusion, (c) Disc extrusion: focal disc extension beyond the interspace with base narrower than the length of the

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extruding material itself and (d) Disc sequestration: when the displaced disc has lost continuity with the parent disc. MRI provides excellent information regarding the effect of disc disease on cord and neural foramen compression.[9-11]

MATERIALS and METHODS

This retrospective analytical study was conducted in the department of Radio- Diagnosis, Father Muller Medical College, Mangalore, Karnataka, India over a period of one year from Jan 2013 to Jan 2018. One hundred Patients of both sexes and all ages presenting with low back pain or/and lower extremity radiculopathy with clinically suspected lumbar intervertebral disc prolapse referred for MRI to the Radiology dept. of our institution were included in the study. Patients with infective, inflammatory, neoplastic and congenital anomalies were excluded. Patients were evaluated for location of their pain, duration of symptoms, and presence of weakness, numbness and parasthesias. All the patients underwent MRI on 1.5 T MRI (Philips Achieva 16 Ch.) scanner. MRI of lumbar spine using surface coil was performed. Imaging consisted of sagittal T_1W images, sagittal T_2W images and axial T_2W images. MR images included in our study were interpreted by a single experienced radiologist to avoid interobserver variations. Using a standardized procedure, presence or absence of disc herniation and magnitude and location of nerve compression were noted. Frequencies and percentages of different MRI findings were made. Chi- square test of analysis was used to determine the significance of association between degree of compression, duration of symptoms, site of pain and presence of numbness with various MRI findings. A p-value of < 0.05 was considered to indicate statistically significant association.

RESULTS

Table 1: Association of nerve compression with distal extremity pain

Nerve Compression	Distal extremity pain				Total	
	Present		Absent			
	No.	%	No.	%	No.	%
Compression Present	57	95	20	50	77	77
No Compression	3	5	20	50	23	23
Total	60	100	40	100	100	100

Chi square test = 27.44; p value = 0.001. Result is significant at p<0.05

Table 2: Association of side of nerve compression with distal extremity pain

Side of nerve compression		Distal extremity pain		Total
		Present	Absent	
Unilateral	Count	38	7	45
	%	66.7	35	58.4
Bilateral	Count	19	13	32
	%	33.3	65	41.6
Total	Count	57	20	77
	%	100	100	100

Chi square test = 6.113; p value = 0.0134. Result is significant at p<0.05

Table 3: Association of disc bulge / herniation with distal extremity pain

Multiple disc pathology		Distal extremity pain		Total
		Present	Absent	
Disc Bulge	Count	17	19	36
	%	59	95	73.5
Disc Herniation	Count	12	1	13
	%	41	5	26.5
Total	Count	29	20	49
	%	100	100	100

Chi square test = 8.0367; p value = 0.004. Result is significant at p<0.05

Table 4: Association of backache with nature of disc pathology

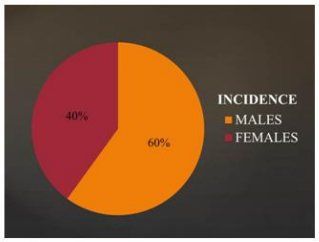
Disc pathology		Backache			Total
		Acute	Chronic	Absent	
Disc Bulge	Count	5	29	2	36
	%	50	85	40	73.5
Disc Herniation	Count	5	5	3	13
	%	50	15	60	26.5
Total	Count	10	34	5	49
	%	100	100	100	100

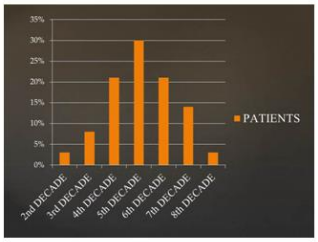
Chi square test = 5.5; p value = 0.019. Result is significant at p<0.05

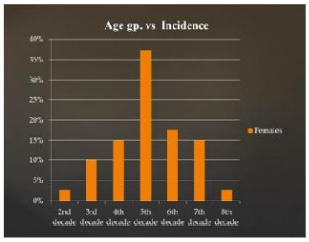
Table 5: Association of severity of nerve compression with nature of backache

Presence of nerve compression		Backache			Total
		Acute	Chronic	Absent	
Nerve Compression Present	Count	13	55	9	77
	%	100	72	82	77
No Compression	Count	0	21	2	23
	%	0	28	18	23
Total	Count	13	76	11	100
	%	100	100	100	100

Chi square test = 4.7014; p value = 0.030137. Result is significant at p < 0.05







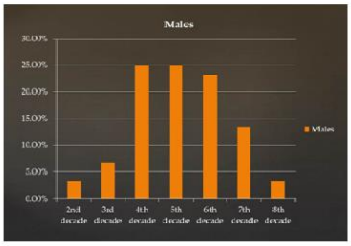
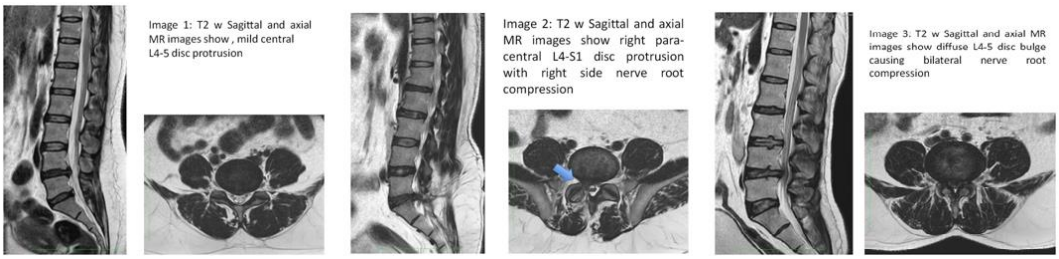


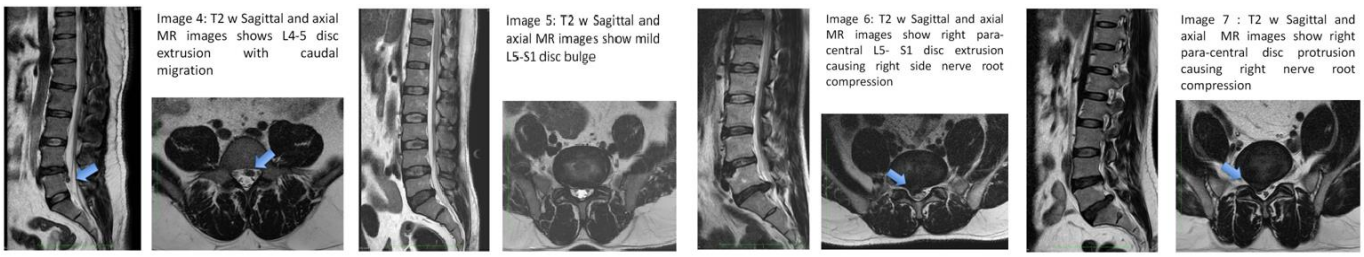
Figure 1 **Figure 2** **Figure 3** **Figure 4**

Legends

Figure 1: Pi Chart showing distribution of male and female patients in our study.
Figure 2: Bar graph showing age distribution of the study population.
Figure 3: Bar graph showing age distribution among the male population.
Figure 4: Bar graph showing age distribution among the female population.

IMAGES





Out of the 100 patients included in the study 60 were males (60%) and 40 were females (40%) (**Figure 1**). Age range was from 20 to 80 years. Maximum patients belonged to the 5th decade (30%) age group (**Figure 2**). Among the males, majority fell into the 4th (25%) and 5th (25%) decade age group with equal proportions (**Figure 3**), while among the females, the commonest age group to be affected was the 5th decade (37%) (**Figure 4**). Out of 100 patients, 13 had history of acute pain (13%) i.e., first episode of low back pain which presented for less than 2 months. 76 patients (76%) had chronic symptoms of longer than 2 months duration. The most common site of pain was the lower extremity in 60 patients (60%) followed by low back and thigh pain. Sensory symptoms such as paresthesia and numbness were present in in 25 patients (25%). The commonest location for disc disease was **L_4- L_5 level** in 51 patients (51%) followed by **L_5- S_1 level** present in 49 patients (49%). Disc bulge was the commonest pathology and 74 patients (74%) had disc bulge while 25 patients (25%) had disc herniation. Overall 77 patients (77%) had MRI evidence of nerve or thecal sac compression. Among the 77 patients who had evidence of nerve compression, distal extremity pain was present in 57 patients and Chi square test showed a strong association with a p-value of 0.001 (**Table 1**). 45 patients (58.4%) had unilateral (right or left) and 32 patients (41.6%) had bilateral nerve root compression. When comparing these sites of nerve compression to sites of radiation of pain, the results show significance with p-value of 0.013 (**Table 2**). On comparing distal extremity pain with the type of disc pathology- disc bulge/ disc herniation, it was seen that distal extremity pain had very strong association with disc herniation, while moderate association with disc bulge with a p- value of 0.004 (**Table 3**). When comparing the association between disc pathology and backache, it was seen that disc herniation was commonest in patients with acute history of backache, while disc bulge was commonest in patients

with chronic symptoms with a p-value of 0.01 (**Table 4**). Severe nerve compression also showed statistically significant association with chronicity of symptoms. It was commonest in patients who had acute onset of backache (**Table 5**). When disc pathology was compared with different age groups, it was seen that single disease pattern was commoner in the younger age group i.e. between 20 to 39 years, multi- level disk involvement were more commoner in adult and older age groups.

DISCUSSION

In our study, the male to female ratio of involvement was 1.5: 1 which corresponded with most of the studies.[12,13] The disease involves the male population more often as they are more involved with heavy manual work. Our study showed that majority of the patients belonged to the 5^{th} decade age group, and the same was true with the study conducted by Cheung and *et al*[14]. The most common level of disc involvement was L_4-L_5 followed by L_5-S_1. This too correlated with the study conducted by Ahmad and *et al*.[13] In our study, single disc and multi-level disc involvement were equally prevalent. Disc bulge (73.5%) was the commonest pathology in our study followed by disc herniation (26.5%). In this study, side of radicular pain correlated with the side of herniation on MR images. Strong association was seen between nerve compression with ipsilateral pain referral distal to knee. It was seen that 72% of the patients with chronic symptoms had evidence of nerve compression on MRI, whereas nerve compression was 100% in patients with acute symptoms. This however did not correlate with the work of Siddiqui A H *et al*.[16]

CONCLUSION

Our study showed good association between clinical symptoms and MRI findings in patients having backache. Nerve compression was strongly associated with distal leg radiculopathy. The side of nerve tissue compression showed strong correlation with the side of radiation of pain to the leg. Patients with acute history are more likely to have disc herniation than disc bulge. Disc herniation is more commonly associated distal leg pain, due to more nerve compression. Prior to undertaking any invasive procedure, clinical features of sciatica and MRI findings of nerve compression or displacement by disc herniation should be correlated.

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