

Incidence and Analysis of Abnormal Magnetic Resonance Imaging of the Lumbar Spine in Asymptomatic Patients: A Cross Sectional Study

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Abstract:-

Introduction: MRI scan are being widely used in detecting spine pathologies for determining treatment protocols. **Aims and Objectives:** To calculate the prevalence of abnormal MRI findings in lumbar spine of patients who never had history of any low back pain or radiculopathy. **Materials And Methods:** MRI of the lumbar spine was done on patients that came to OPD without any prior history of low back ache or sciatic pain. These patients were screened with a standardized questionnaire. MRI scans were done for detecting the underlying cause of neck pain in these patients and along with these scans special cuts were also taken in the lumbar spine to detect any abnormalities in the lumbar spine. These scans were analysed independently by radiologists and spine surgeons who had no prior knowledge about the presence or absence of clinical symptoms. **Results:** Among 500 subjects examined an abnormal MRI scan was seen in 148 patients. A herniated nucleus pulposus was seen in 118 patients. Disc protrusion was seen in 44 patients and disc extrusion in 4 patients. Lumbar canal stenosis was seen in 98 patients. Spondylolisthesis was detected in 80 patients all of which were of mild variety. Facet joint arthropathy was seen in 44 patients and joint effusion was seen in 5 patients. 15 patients had lumbarization of S1 vertebra and 24 patients had sacralization of the L5 vertebra. **Conclusion:** A high number of patients who had no positive history of lumbar spine pain or radiating pain had abnormalities detected on their MRI scans. In the current study, about 30 per cent of asymptomatic population had significant abnormalities noted on their MRI scans. Hence a step towards an operative procedure should not be taken purely on the basis of imaging studies without knowledge of clinical symptoms of patient.

I. INTRODUCTION

Magnetic resonance imaging scans are being regularly used in detecting conditions causing low back pain and radiating pain to the lower limbs. MRI scans are said to be highly sensitive in the detection of annulus fibrosus tears either partial or complete that cannot be detected with other non invasive imaging modalities. In many spine centers, there is a trend of doing MRI screening of the whole spine. We decided to take this opportunity and calculate the prevalence of abnormal MRI findings in lumbar spine of

patients who never had history of any back pain or radiating pain to lower limbs.

➤ Aims And Objectives

To detect and calculate incidence of abnormal MRI scans of the lumbar spine in asymptomatic patients

II. MATERIALS AND METHODS

Magnetic resonance imaging of the lumbar spine was done on patients that came to MGM orthopedic OPD with no previous history of low back ache or sciatic pain.

These patients had come to our center with complaints of neck pain with no symptoms of low back ache.

The subjects were screened using a standardized questionnaire, and only those patients giving no history of pain in the back, sciatica, or neurogenic claudication were included in the study. An incident of low-back discomfort without radiating pain to the lower limbs which lasted more than 24 hours or had warranted absence from work excluded the candidate from the study. Subjects were also not included if they had radiating pain or sensory disturbances along the buttocks or lower limbs) or if walking even a short distance caused sensory disturbances or cramping pain in a lower limbs¹.

MRI scans were done for detecting the underlying cause of neck pain in these patients and along with these scans special cuts were also taken in the lumbar spine to detect any abnormalities in the lumbar spine.

The subject who entered in the study underwent multiplanar MRI from L1 to S1 vertebra along with screening of the whole spine using a 1.5 tesla imaging system (Seimens MRI machine). The sagittal cuts were taken with a repetition time of four hundred milliseconds, an echo time of 20 milliseconds, with each slice of 5 millimeters thickness at 1 mm intervals, and a 34cm field of view. For sagittal cuts having a field of view of twenty-four-centimeter was taken with a multiple spin-echo technique and a repetition time of thousand milliseconds, to produce 5mm thick slices at 1mm intervals after four excitations. There were 2 echoes generated; one having an echo time of 20 milliseconds (T1 weighted) and the second with an echo time of 70 milliseconds (T2 weighted). Axial cuts were acquired through the disc space with 4mm thick slices at 1

mm intervals having a repetition time of 600 milliseconds and an echo time of twenty milliseconds⁴.

These scans were evaluated independently by radiologists and spine surgeons who were not given any history about the presence or absence of clinical symptoms. They read the scans of these 500 subjects and reported accordingly if any abnormal findings at the level of each disc like herniated discs or canal stenosis or facet joint abnormalities were detected.

An extrusion was a herniated nucleus pulposus of focal origin with extension of disc material beyond the osseous confines of the vertebral body, causing displacement of nerve root, thecal sac or epidural fat. A bulge was said to be a diffuse protrusion of non-osseous material that was non focal and extended beyond the confines of a normal disc space. A spinal canal stenosis was described as a non-discogenic loss of signal in the epidural fat with neural tissue compression within the canal. A decreased signal on T2-weighted sequences with reduction in disc space height was considered to be a degeneration of the disc.

The neuroradiologists analyzed each level of disc, and after assessing for any abnormal finding subjectively they scored the abnormalities quantitatively and objectively. The average of the score from each analyst was taken and accordingly the diagnosis and the severity of the lesion were tabulated according to the subject's age.

Using an ordinal scale grading of each disc each disc was done with zero being normal and 3 being the most severe with a free disc fragment, severe stenosis or severe disc degeneration.

Fardon and Millette's² described a lateral recess as one extending from the medial edge of the facet to the edge of the neural foramen. Mild stenosis was defined as narrowing of 1/3rd of the normal canal, moderate stenosis as narrowing of between 1/3rd-2/3rd, and severe stenosis as narrowing of more than two-thirds of the canal. Axial images were used to grade central stenosis and lateral recess stenosis whereas sagittal images helped in grading foraminal stenosis. In case of lateral and foraminal stenosis, the side having a worse score was considered.

The facet joints were graded according to the severity of their arthritis by a classification system adapted from Weishaupt et al.

Grade	Criteria
0	No sclerosis, osteophytes or narrowing
1	Irregularity or narrowing of joint space
2	osteophyte formation with canal narrowing plus sclerosis and/or hypertrophy
3	severe osteophyte formation with complete canal narrowing and sclerosis

Table 1. Grading of facet joint arthritis

Only those findings which the investigators had pointed out to be probably or definitely abnormal were considered as abnormal findings. Findings that were rated as being not significant to the diagnosis were not considered in the study. On the end, the total number of asymptomatic subjects who had positive findings was analyzed and the prevalence of abnormal magnetic-resonance images of the lumbar discs of asymptomatic subjects was established.

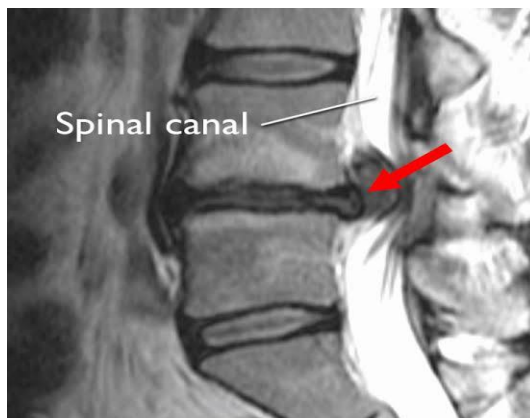


Fig 1. Herniated disc

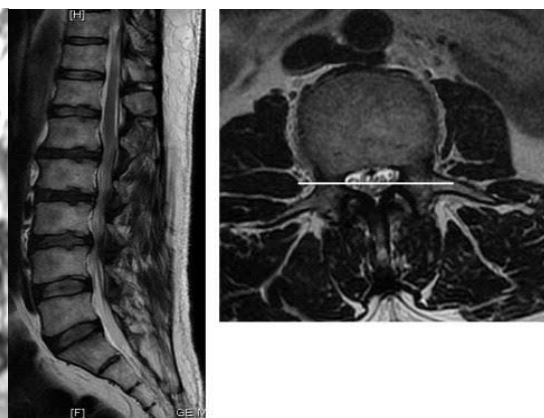


Fig 2. Lumbar canal stenosis

MRI findings	points
(A)Herniated nucleus pulposus	
Normal	0
Protrusion (nucleus pulposus contained in the annulus fibrosus but with contour abnormality)	1
Extrusion (nucleus pulposus extending through the annulus fibrosus but still contiguous with the host nucleus)	2
Free fragment (migration of herniated fragment away from the disc space)	3
(B)Stenosis of the canal (nondiscogenic loss of normal epidural fat with compression of neural tissues within the canal)	
Normal	0
Mild (flattening of the ventral thecal sac)	1
Moderate (triangularization of the spinal canal with loss of the posterior epidural fat pad)	2
Severe (compression of the canal with loss of epidural fat in all planes)	3
(C) Disc bulge	
Normal	0
Asymmetric	1
Diffuse (non focal, non osseous material extending beyond the normal disc space in a circumferential manner)	2
(D) Disc degeneration	
Normal	0
Mild (slight dehydration of the disc on T2-weighted images)	1
Moderate (disc dehydration and mild loss of disc height)	2
Severe (total disc dehydration with nearly complete loss of disc height)	3

Table 2. Abnormal MRI findings

INCLUSION CRITERIA

- Age between 20-70 years
- Symptoms of neck pain
- Symptoms of upper limb radiculopathy
- No H/O back pain
- No H/O sciatica
- No H/O neurological claudication

EXCLUSION CRITERIA

- Episode of low back discomfort lasting more than 24 hours
- H/O absentee from work due to low back pain
- Sensory abnormalities in lower limbs
- Pain while walking distance of less than 500m
- History of trauma to spine
- History of any congenital abnormalities of spine
- Age less than 18 and more than 50 years

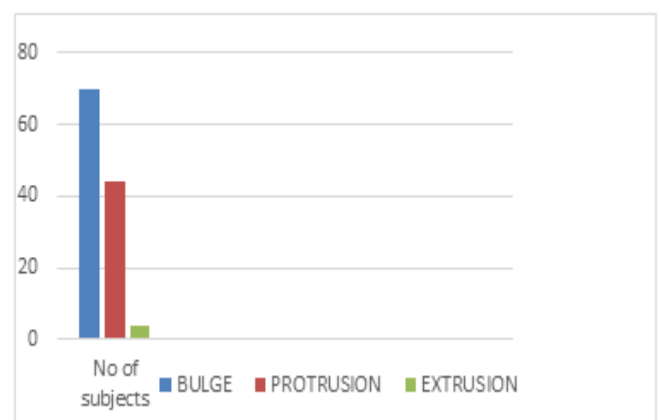
III. RESULTS

Out of a total of 500 subjects examined an abnormal MRI scan was seen in 148 patients. The incidence of abnormal MRI was found to be more or less similar in both men and women of the age group considered in the study.

From these 148 patients a herniated nucleus pulposus was seen in 118 (80%) patients. Of these maximum number of herniated discs were seen at the level of L5-S1 (46 patients) followed by L4-L5 (39 patients).The other discs seen were at L3-L4 (25 patients), L2-L3 (11 patients) and L1-L2(7 patients) Out of these patients a disc bulge was seen in 70 subjects, protrusion was seen in 44 patients and disc extrusion was seen in 4 patients. None of the patients had disc sequestration.

Age group	Location of bulge					No. of subjects with disc bulge at more than 1 level
	L2	L3	L4	L5	S1	
20-29	0	0	0	2	1	0
30-39	1	1	5	5	4	2
40-49	1	1	3	6	8	5
50-59	3	5	6	9	13	12
>60	2	4	11	17	20	16

Table 3. Age wise distribution of PIVD



Graph 1. Grade wise incidence of PIVD

➤ Annular tears were detected in 94 subjects.

An abnormal scan showing lumbar canal stenosis was seen in 98 (19%) patients. From these mild variety was seen in 78 subjects while moderate canal stenosis was seen in 22 subjects. None of the patients had a severe lumbar canal stenosis. Central and lateral canal stenosis had the highest prevalence at L4/5, followed by L3/4 whereas foraminal stenosis which was comparatively rare had its highest prevalence over L5-S1 followed by L4-L5. More than a third of the subjects had a canal stenosis of at more than one level.

	L2-L3	L3-L4	L4-L5	L5-S1
Central stenosis	22	35	48	34
Lateral stenosis	11	25	37	23
Foraminal stenosis	4	6	15	16

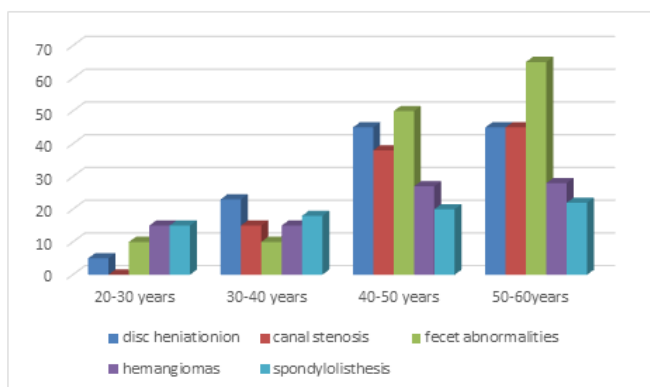
Table 4. Incidence of canal stenosis

Asymptomatic hemangiomas were seen in 85(17%) of these patients. Spondylolisthesis was detected in 80(16.7%) patients all of which were of mild variety. None of the patients had severe spondylolisthesis.

The most common non intervertebral disc symptom in people not having any symptoms were shmorl’s nodes which were basically disc herniations into the vertebral body end plates seen in 95 (19%) of the subjects.

Out of the 500 scans read it was observed that there 44 patients having an abnormal facet joint. A facet joint arthropathy was seen in 42 patients, joint effusion was seen in 5 patients but none of the subjects had asymptomatic facet cysts. Almost two thirds of the subjects had grade 1 facet joint arthritis with the incidence increasing significantly above the age of 45. When observing the joint arthritis at each level there was a trend of arthritic degeneration being more at the caudal segments like L5-S1 as compared to the cephalad ones.

From the 148 patients it was seen that 15 subjects had lumbarization of S1 vertebra and 24 subjects had sacralization of the L5 vertebra.



Graph 2. Age wise incidence of abnormal MRI findings

IV. DISCUSSION

A major percentage of subjects who never had low-back pain or radiculopathy had abnormal findings on their magnetic resonance imaging. In our study, about 30 per cent of an asymptomatic population was seen to have a major abnormality on a magnetic resonance image of the lumbar spine. Taking into consideration the wide prevalence of back pain in our country the finding of an abnormality on MRI scan in a patient without back ache can be just coincidental. Hence the the MRI reports should always be correlated with the clinical findings of the patient. Any abnormality of the lumbar spine detected only on MRI does not hold value if considered in isolation.

Importance was given for the exclusion of those subjects who had any history of back pain, sciatica, or neurogenic claudication. In older individuals it was common that the subjects did not remember remote incidents of back pain, but such error was minimized by using a standardized questionnaire that provided the necessary information with various arrays of questions. Subjects with memory problems or having a doubtful history were excluded from the study.

Abnormalities in the disc of lumbar spine of asymptomatic people is a common fact. A study on 33 cadavers presumed to have no symptoms of back pain, a postmortem examination of the entire spine showed posterior disk protrusions in 39 percent of the subjects⁴. In another study, 300 myelograms were carried out in people without symptoms in which 24% of the people showed abnormalities of the lumbar disk⁷. Wiesel et al³. with the help of CT scans examined 52 people having no history of back pain and found the prevalence of herniated disks to be 19.5 % in people under the age of 40 years and 26.9 percent the people above 40 years of age; though only 2 disc levels that is only the L4-5 and L5-1 intervertebral disks were evaluated. In our study, 23.6% of the subjects had disk bulges maximum being at the L5-S1 and L4-L5 levels. Boden et al.¹ used magnetic resonance imaging in 67 people without symptoms and found herniated disks in 20% of the subjects less than 60 years old and in 36 % of subjects above 60 years. In another study, 41 women free of back pain underwent MRI examination which showed that 54 percent subjects had a disk bulge or herniation at least one disk spaces, although only L3-4, L4-5, and L5-1 levels were examined.

Annular tears cause pain due of leakage of the contents of the nucleus pulposus into the epidural space causing nerve irritation, but disc degeneration can also occur as a result of annular tears. In our study, all the disks having annular tears had an associated disc bulge or protrusion alongside. Hence it throws light to the fact that annular defects are generally associated with disk degeneration even though such defects are frequently asymptomatic.

Non discogenic diseases such as facet arthropathy had been an important source of low back pain and sciatica. Our study undermines the fact that facet disease can be the

source of pain, since 8.8% of our subjects without back pain had facet arthropathy.

V. CONCLUSION

A high number of patients who had no positive history of lumbar spine pain or radiating pain had abnormalities detected on their MRI scans. In the current study, about 30 per cent of asymptomatic population had significant abnormalities noted on their MRI scans. This finding that an asymptomatic individual has more than 25% chance of having an abnormal magnetic-resonance image emphasizes on the danger of taking a decision to operate only on the basis of only diagnostic tests without taking detailed history and thorough clinical examination into consideration. Hence a step towards an operative procedure should not be taken purely on the basis of imaging studies without knowledge of clinical symptoms of patient.

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