

Role of MRI to Rule Out Non Discogenic Causes of Nerve Root Compression

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ABSTRACT

Objective: The purpose / intention of this study is to highlight that MRI is good diagnostic tool to interpret non discogenic causes of lumbosacral radiculopathy because of nerve root compression.

Study Design: Cross-sectional descriptive study involving Medical Imaging (MRI) and clinical review.

Place / Duration of the Study: This above mentioned study was piloted conducted in Diagnostic Radiology Wing of DHQ / Teaching Hospital, Gujranwala from 1st July 2017 till 30th June 2018.

Materials and Methods: 100 Patients with history of backache referred for MRI spine were scanned after informed consent at Siemens Syngo 1.5T MR system. Non-ionic Gadolinium contrast was used in suspected discospondylitis.

Results: It was concluded from our study that lumbosacral ratio of nerve root compression due to non-discogenic causes (52%) (n=52) is greater than disc prolapse causes (48%) (n=48). Most common non discogenic cause of nerve root compression was facet joint hypertrophy. Other non discogenic causes of nerve root compression include traumatic (10%), Spondylolisthesis (5%), infection (14%), Neoplastic (2%) and sequestered disc segment (2%). Disc bulge was major discogenic cause of nerve root compression at lumbar spine.

Conclusion: MRI provide valuable information regarding detection of lumbar radiculopathy causes. Most common causes of lumbar radiculopathy are non-discogenic pathologies rather discogenic cause.

Keyword: Magnetic resonance imaging (MRI); Discogenic; Non discogenic; Spondylolisthesis; (LBP) Lower back pain.

INTRODUCTION

MRI is the best modality of the 20th century with excellent soft-tissue contrast in diagnosis of backache and neuropathies. Access to new imaging techniques is proposed to enhance diagnostic accuracy and facilitate powerful remedy for higher fitness results. Nowadays, it becomes first-line investigation for neuro physicians and orthopedic surgeons in cases of backache and sciatica. (1) Magnetic resonance imaging is sensitive enough to detect a tear of the annulus fibrosus, cartilage integrity, marrow compartment along with Multiplanar capabilities (2). It can detect herniated disc bulges, compressing of nerve roots, spinal tumors, spinal cord compression and fractures (3). It also different spinal abnormalities which can be divided in to intraspinal and extra spinal. Intraspinal further subdivided into intradural and extra dural component (4)

Prevalence of true lumbar radiculopathy in population is about 3% to 5%. More than 50% of adults have experienced lower-back pain at least once in their life. It is strongly believed that working-age adults group is more prone to face low back pain, which is ranked as the highest cause of incapacity / disability than any other situation globally in the world. The standard burden of LBP arising from ergonomic exposures at paintings changed into expected at 21.8 million [95% Confidence Interval (CI) 14.5–30.5] incapacity adjusted existence years (DALYs) in 2010. Several studies have been explored that the sensitivity of MRI for the early diagnoses disc bulges and spinal canal stenosis is equivalent to or better than that of computerized tomography, even when computerized tomography is combined with myelography or discography (5,6,7).

MRI is considered to be the diagnostic device of choice in diagnosing nerve root compression amongst sufferers supplying with medical suspicion of spinal radiculopathy. Radiculopathy means; pain radiating down to arms or legs in a dermatomal distribution. This can manifest as pain, numbness, or weakness of the arm, buttock or legs (8,9).

Diagnostic utility of MRI is assessing discogenic cause of lower back pain is well documented. However, regarding nerve root compression its diagnostic accuracy still remains questionable. Most often patient's symptoms do not correlate with clinical examination. This action may result in misdiagnosis, unusual delay in tests and treatment. The central purpose / aim of

this study is to find diagnostic accuracy of MRI in non-discogenic pathologies of lumbar radiculopathy.

METHODOLOGY

This is cross Sectional descriptive Study performed at Department of Radiology, DHQ Teaching Hospital, Gujranwala from 1st July 2017 to 30th June 2018. The ethical approval of this study taken wide letter no. admin 290/GMC.

After informed consent first 100 patients (letter attached from statistician) presented with backache and numbness of lower limbs were scanned for MRI lumbar spine on Siemens Syngo 1.5T MR system. All patients of 13 to 60 years with backache were included in the study. History of patients including age, sex, location and intensity of pain, associated with trauma or fall, radiating or not radiating and examination was carried out. We exclude patients with at-least one absolute contraindication, non-cooperative patient, patient with metallic implants, claustrophobia, pacemaker and cochlear implants in situ.

Data collection: 100 patients were included in the criteria from indoor branch of Radiology, DHQ Teaching Hospital, Gujranwala and were covered in the examination after permission from moral committee. Informed consent was taken from affected person. Basic demographics like age, gender and duration of complaints have been mentioned.

Standard MRI Lumbar spine protocol

For the spine, our standard imaging protocol in degenerative disc disease and nerve root compression consists of:

Turbo spin echo sequences sagittal T2- and T1-weighted images, Axial T2- and T1-weighted images at selected levels.

Element selection is 1 to 5 according to region.

Slice thickness = 4mm

All cases with suspicion of non-discogenic nerve root compression was referred to other specialist like orthopedic, vascular, general surgery and neurology.

Standard MRI lumbosacral spine performed using surface coil of every patient.

Data analysis: Data was come into and analyzed through SPSS edition 23. Mean ± standard deviation was calculated for all quantitative variables like age and duration of complaints. For qualitative like gender, frequency and percentage become calculated. Sensitivity, specificity, Positive predictive value,

Negative predictive value and diagnostic accuracy for MRI against medical final results changed into calculated through the use of 2X2 model. Effect modifiers like age, gender and period of bitch were managed by means of stratification. Post stratification the use of diagnostic accuracy became calculated, $p < 0.05$ was taken into consideration statistically tremendous.

RESULTS

Out of a hundred patients 75 were males and 25 were females with age of patients ranging from 13 to 60 years. Non discogenic causes of nerve root compression (facet joint hypertrophy, inflammation, traumatic, spondylolisthesis, sequestered disc fragment, neoplastic, and others including synovial cyst, osteophytes, congenital) are more evident than discogenic cause, about 52% and 48% respectively.

In our study the most common non discogenic cause of nerve root compression was the facet joint hypertrophy which is more common in patients between age 40-60. Other non-discogenic causes of nerve root compression included traumatic (10%), Spondylolisthesis (5%) which were more common in patients among age 25-40. Another non discogenic cause of nerve root compression was inflammatory (14%) which was mostly found in the age group between 40 and above 60. Some other non-discogenic causes of nerve root compression include Neoplastic (2%), Sequestered disc segment (2%) and Others synovial cyst, osteophytes, congenital (1%). According to our study major causes of nerve root compression in discogenic causes was disc bulge which was 25% of all nerve root compression. It was at an age of 40-60 and above 60 years. Other discogenic causes include disc protrusion (15%) and Disc Extrusion (8%) which also seen at an age between 40 -60. From our study it is also concluded that nerve root compression due to discogenic causes mostly occur between age 40-60.

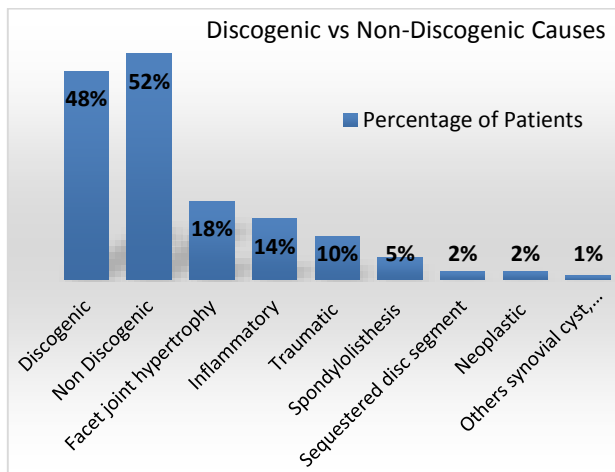


Figure 1: Chart of Incidence of Non discogenic and discogenic Lumbar radiculopathy.

Table 1: Caused of non-discogenic a cause of Lumbar radiculopathy. (n = 100 patient)

Non Discogenic causes of nerve root compression	Percentage of patients
Facet joint hypertrophy	18%
Inflammatory	14%
Traumatic	10%
Spondylolisthesis	5%
Sequestered disc segment	2%
Neoplastic	2%
Others synovial cyst, osteophytes, congenital	1%
Discogenic causes	Percentage of patient
Disc Bulge	25%
Disc protrusion	15%
Disc Extrusion	8%



Figure No. 2. 45 years-old male with complain of lower backache. Multi echo multiplanar both Sagittal and axial images through the lumbar spine shows (Right)left lateral disc bulge with left lateral annular tear with bilateral facet and ligamentum hypertrophy with left lateral annular tear abutting bilateral exiting nerve root at L4/L5 level. (Left)Complete disc desiccation with reduced disc space and anterior disc protrusion noted at L5/S1.Axial images reveal diffused disc bulge with central annular tear with bilateral facet and ligamentum flavum.



Figure No.3 Male patient 30 years-old with history of fall Multiecho and multiplanar MRI T2 sagittal + Axial images through lumbosacral spine shows anterior wedge compression fracture with destruction of L2 vertebral body causing retropulsion osseous component indenting the thecal sac and compressing the bilateral exiting nerve root at L2/L3 level.

DISCUSSION

Nerve root compression is common finding on MRI spine caused by discogenic and non-discogenic causes. The current study was designed to find how accurately MRI detects non-discogenic causes of nerve root compression. Nerve root compression is common finding on MRI caused by discogenic and non-discogenic causes. In this study we found that non-discogenic causes account for 52% cases while discogenic causes account for 48% cases of

nerve root compression. In our study most, common group of non-discogenic causes is facet joint arthrosis/hypertrophy which accounted for 18% of cases of lumbar radiculopathy. Eubanks et al. found that osteoarthritis because of osteoporosis may be found in early life, with more than one half of adults and younger patients less than 30 years⁽¹⁰⁾ While in our study facet joint hypertrophy which was more common in patients between age 40-60. In another study, Kalichman et al. showed a high prevalence of facet joint hypertrophy due to osteoarthritis in a community-based population including 59.6% of males and 6.7% of females, which increases with age⁽¹¹⁾ While in our study male ratio is greater than females and most likely osteoarthritic changes are more common in males. Leo F. Czervionke et al. conducted a study in which out of 209 patients including males and females, 85(41%) showed evidence of facet synovitis.⁽¹²⁾ Whereas, in our study 14% patients had nerve root compression because of inflammatory which occur mostly at age group between 40 and above 60. Facet synovitis has not been recognized as separate entity in patients with low back pain.⁽¹³⁾

One of the studies on elderly people in a Japanese village depict that cross-sectional study of the elderly population from a single Japanese village with 205 elderly men (mean age, 70.7 years) and 323 elderly women (mean age, 70.5 years), Horikawa et al reported spondylolisthesis prevalence of 4.9% for males, and 11.5% for females.⁽¹⁴⁾ While in our study there were 100 patients (75% males and 25% females) with age between 25-60 in which 5% patient has nerve root compression because of spondylolisthesis which is more common among patients between 25-40 years of age.

Our study concludes that non-discogenic causes of nerve root compression include traumatic (10%), which are more common in patients between ages 25 and 40. Some other non-discogenic causes of nerve root compression include neoplastic (2%), Sequestered disc segment (2%) and others; synovial cyst, osteophytes, congenital (1%).

According to our study disc bulge is major discogenic cause of nerve root compression which account 25% of all nerve root compression. It occurs at an age of 40-60 and above 60. Other discogenic causes include disc protrusion (15%) and disc extrusion (8%) which also occur at an age between 40 -60. From our study it is also concluded that nerve root compression due to discogenic causes mostly occur between age 40-60.

As mentioned above in our study there were total 48% cases of nerve root compression due to discogenic causes which include disc bulge, disc protrusion and disc extrusion. Dr. Sasi Kuppaswamy et al. conducted a study in which there were 76 subjects among the 120 individuals screened, with a mean age of 43.7. There were 45 females and 31 males. Mean age was 43.7 with a standard deviation of 11.4. The maximum participation was in the age group 50-60 years. In each patient 5 levels (L1-L2, L2-L3, L3-L4, L4-L5 and L5-S1) were reviewed. Therefore, a total number of 380 discs were evaluated for disc degeneration and herniation and studied 380 discs in four different age groups. Among disc herniation 273 discs (71.8%) were normal and 107 discs (28.2%) were having pathological changes in the form of bulge 68(17.8%), protrusions 30(7.8%) and extrusions 9(2%).⁽¹⁵⁾

Another study done by Michael T Modic et al. Herniation became diagnosed in 60% (n = 147) of sufferers at the initial effects. The occurrence of herniations in patients with LBP (fifty seven%) (n = eighty five) and those with radiculopathy (65%) (n = sixty two) have been similar (P = .217), despite the fact that patients with radiculopathy have been much more likely to have stenosis and nerve root compression (P < .006).⁽¹⁶⁾ ⁽¹⁷⁾ ⁽¹⁸⁾ ⁽¹⁹⁾ ⁽²⁰⁾

CONCLUSION

MRI provides valuable information regarding detection of lumbar radiculopathy causes. Most common causes of lumbar radiculopathy are non-discogenic pathologies rather than discogenic causes.

Recommendation: MRI became first line investigation by clinicians in making a decision lumbar radiculopathy whether managed conservatively using rehabilitation, physiotherapy, oral medications or surgical intervention. Lower back pain is relatively more common in men with etiology broadly divided into discogenic and nondiscogenic causes which is slightly higher in proportion. It is further subdivided into facet arthrosis, inflammatory, traumatic, spondylolisthesis and neoplastic causes.

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