Section: Radio-Diagnosis

Original Research Article

ROLE OF MRI IN EVALUATION OF NON-TRAUMATIC CAUSES OF LOW BACKACHE IN YOUNG ADULTS

Monika Shukla[1],Megha Jain[2],Swapnil Puranik[3],Monika Puranik[4]

[1]Senior Resident, Department of Radio-Diagnosis, L. N. Medical College &Research Centre, Bhopal, Madhya Pradesh, India.
[2]Professor & HOD, Department of Radio-Diagnosis, L. N. Medical College & Research Centre, Bhopal, Madhya Pradesh, India.
[3]Professor, Department of Radio-Diagnosis, People's College of Medical Sciences and Research Centre, Bhopal, Madhya Pradesh, India.
[4]Associate Professor, Department of Radio-Diagnosis, L. N. Medical College &Research Centre, Bhopal, Madhya Pradesh, India.

Received : *23/11/2023*
Received in revised form : *02/01/2024*
Accepted : *18/01/2024*

Keywords:
Low backache (LBA), non-traumatic causes, lumbar spine (LS), degenerative changes, Magnetic resonance imaging.

Corresponding Author:
Dr. Monika Puranik,
Email: mncbapat@gmail.com

DOI: 10.47009/jamp.2024.6.1.173

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 880-884

Abstract

Background: Low backache or lumbago is one of the most common morbidity faced in clinical practice, having significant socioeconomic consequences. According to the Global Burden of Disease report published in the year 2020, low back pain is the 5th most common cause of disability and work absenteeism. Therefore present study was conducted to assess the role of MRI in evaluation of nontraumatic causes of low backache in young adults. The aim is to study various non traumatic causes of low backache in young adults and their prevalence on basis of MRI. To discuss spectrum of imaging findings in various non-traumatic causes of low backache. **Materials and Methods:** All non traumatic young adult patients complaining of low backache, referred to the Department of Radio-diagnosis of our institute for MRI LS spine, during 18 months from the year 2021-2022 were selected for the study. Patients belonging to age group of 19-40 years of both gender were included in the study. The data collected was tabulated in Microsoft Excel and MRI findings were interpreted independently and subsequently correlated with clinical history and examination findings from patient's records. **Results:** The degenerative disc disease was present in 286(78.1%) subjects, Seronegative spondyloarthropathy in 28(7.7%) subjects, Spondylolysis/listhesis in 25(6.8%) subjects, Pott's spine/ infective etiology in 19(5.2%) subjects, Scoliosis in 12(3.3%) subjects, Congenital causes in 5(1.4%) subjects, Mass/neoplastic in 4(1.1%) subjects, Scheuermann's disease in 2 (0.5%) subjects and other in 10(2.7%) subjects. **Conclusion:** In non-traumatic cases, degenerative disc disease is the main etiological factor of low back pain in young adults and L4-L5 level was the commonest affected site. MRI remains the modality of choice not only in detailed evaluation of degenerative discal changes but also other low backache causes like seronegative spondyloarthropathy, infections, and neoplastic conditions.

INTRODUCTION

Low backache (LBA) is a prevailing problem that affects almost two thirds of adults at some time in their lives.[1] Low backache or lumbago is one of the most common morbidity faced in clinical practice, having significant socioeconomic consequences. According to the Global Burden of Disease report published in the year 2020, low back pain is the 5th most common cause of disability and work absenteeism.[2] Low backache is defined by the location of pain, typically between the lower rib margins and the buttock creases. It is commonly accompanied by pain in one or both legs. The commonest location / origin of LBA is the lumbar spine.

The prevalence of low backache is as high as 70-85%.[3] The etiology cannot be ascertained in 95% of the patients, where the patient may have suffered a muscular or ligamentous injury.[4,5] According to the Institute for Clinical Systems Improvement, the duration of 0–6 weeks is defined as acute LBA, 6–12 weeks as subacute LBA, and more than 12 weeks as chronic LBA.[6] The causes of low backache include abnormalities of the lumbosacral spine or those related to the soft tissue surrounding the lumbosacral spine.[1] The commonest preceding

ISSN (O): 2687-5365; ISSN (P): 2753-6556

cause of LBA is degenerative changes. Other common non traumatic causes of low backache in young adults (20-40years) include seronegative spondylo-arthropathy, infective spondylodiscitis, spondylolysis/listhesis, bony deformity, Scheuermann's disease, congenital and neoplastic etiology. However, in most cases, the LBA resolves completely or partially within 6 weeks of onset and only 10-30% of patients complain of LBA beyond 10-12 weeks of onset. However, if the low back pain persists i.e., it becomes chronic or acute pain is associated with neurological symptoms then it should be immediately investigated in detail. Imaging modalities available for LBA include radiograph, computed tomography (CT), MRI, nuclear medicine, and discography.[7] Advanced imaging is done in young adults frequently to identify rare but high consequence conditions, such as infection or primary spinal neoplasms. However, these pathologies are causative in less than 1% of all patients with LBA. MRI can most accurately identify the spondylotic changes responsible for low back pain because it provides multiplanar imaging capability, superior delineation of intervertebral nerves, ligaments, paraspinal muscles, epidural fat, cerebrospinal fluid, and bone marrow. MRI is considered to be the best imaging technique for the investigation of LBA.[8] As the use of MRI Lumbosacral Spine becomes more widespread, physical therapists are becoming increasingly interested in the interpretation of MRI findings and the role of MRI Lumbosacral Spine in clinical decision making. Therefore, the present study was conducted to assess the role of MRI in evaluation of nontraumatic causes of LBA in young adults.

MATERIALS AND METHODS

After obtaining the permission from the institutional ethical committee, the study was performed on all those non-traumatic young adult patients complaining of low backache, referred to the Department of Radio-diagnosis, LN Medical College and Research Centre, Bhopal, Madhya Pradesh, India, for 18 months from the year 2021-2022. Patients belonging to age group of 19-40 years of both gender were included for the study. Patients with recent history of trauma/RTA, age<19 or >40years, with previous operative history, contraindication to MRI- cochlear implant, pacemaker, claustrophobia and pregnant patient and those who refused to give consent, were excluded from the study.

Clinical history and physical examination findings were noted. The patients were briefed about the procedure and instructions were given. Informed written consent was taken. Patients were asked to remove metallic objects, change into hospital gown and scanned with metal detector to rule out any metallic foreign body/ implant. MRI was conducted using standard MR protocol on high field 1.5Tesla Philips Multiva MR Imaging system. Patient was placed supine, head first, in spinal/body coil and immobilized with cushions. A saturation band was placed over abdomen during sagittal sections to avoid abdomen motion artifact. The laser beam localizer was centered 4 inches above iliac crest, in mid abdomen. A three plane localizer was taken to localize and plan the sequences. Various sequences including T1WI and T2WI in sagittal and axial planes and coronal STIR were obtained.

The following criteria were evaluated on MRI: Spinal curvature, Lumbar disc degeneration, disc herniation (graded as normal, bulge, protrusion, extrusion and sequestration), annular tear, nerve root compression, and vertebral marrow endplates changes (graded as per Modic classification), zygapophyseal joint arthropathy, lumbar spondylolysis, spondylolisthesis, and canal stenosis, sacroiliac joint for sacroilitis & vertebral segmentation, vertebral body destruction/ collapse/ wedging, pre/paravertebral or paraspinal soft tissue abnormality, cauda equina nerve roots, intradural soft tissue/lesion.

The final reporting was done by four of our qualified and experienced radiologists individually who had previous experience of about eight to ten years or more in the field of MRI reporting. The data collected was tabulated in Microsoft Excel and the MRI findings were interpreted and subsequently correlated with clinical history and examination findings from patient's records.

RESULTS

Figure 1: Extrusion, MRI LS spine (a)Sagittal and (b)axial T2W image showing large extrusion of disc causing severe canal stenosis with compression of B/L traversing and cauda equina nerve roots.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

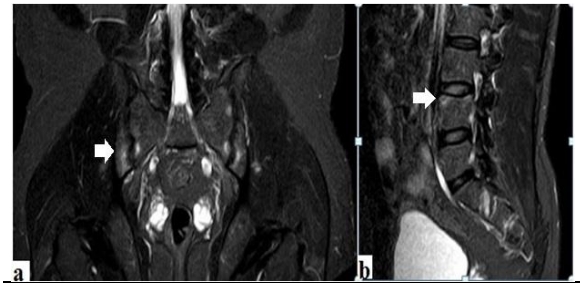

Figure 2: Ankylosing spondylitis, (a) MRI SI joint Coronal STIR sequence showing symmetrical subchondral marrow edema. (b) MRI LS spine Sagittal T2W image showing Romanus lesion at superior endplate of L4 vertebra

Table 1: Distribution of subjects according to presence of pathology

Conditions	Frequency	Percentage
Degenerative disc disease	286	78.1
Seronegative spondyloarthropathy	28	7.7
Spondylolysis/listhesis	25	6.8
Infective spondylodiscitis	19	5.2
Scoliosis	12	3.3
Congenital/developmental	5	1.4
Mass/neoplastic	4	1.1
Scheuermann's disease	2	0.5
Others	10	2.7

* Distribution of subjects according to the presence of pathology.

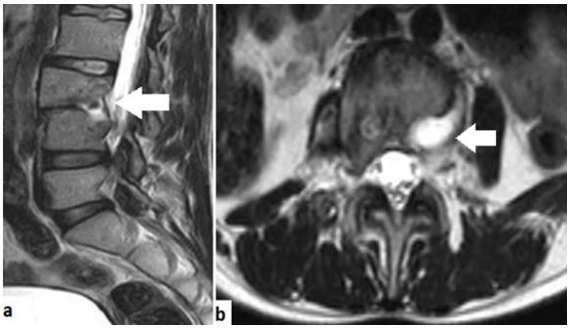

Figure 3: Infective spondylodiscitis Sagittal T2WI (a) and axial T2WI (b) showing end plate erosion with loss of intervening disc space noted at L3-4 level and associated T2 hyperintense paravertebral abscess limited to left posterolateral aspect of L4 vertebra.

Figure 4: Low lying tethered cord with dorsal dermal sinus, MRI LS spine Sagittal T2W image showing low lying spinal cord with posterior tethering at S3 level and conus ending below L2 level(white arrow). Dorsal dermal sinus is seen as hypointense tract extending from posterior spine at S2 level(red arrow).

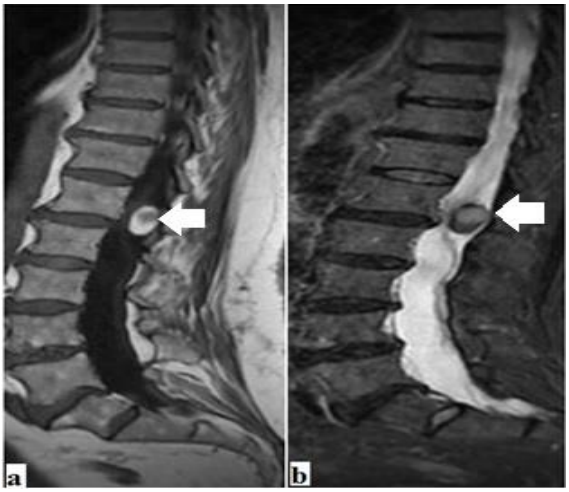

Figure 5: Dermoid cyst, MRI LS spine, (a) Sagittal T1W image and (b) STIR sequence showing intradural extra-medullary lesion with fat and soft tissue component at L1-L2 level, just distal to conus.

Figure 6: Scheuermann's disease, MRI LS spine, Sagittal T2W image showing (a) anterior wedging of D11, D12 and L1 vertebrae, (b) anterior Schmorl's nodes at L2 and L3 vertebrae.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Out of total 366 MRI done, 88.8 % (n=325) were abnormal and 11.2 % (n=41) were normal. Of total patients, 193 (52.7%) were male and 173 (47.3%) were female subjects Mean age was 33 years.

Based on the presence of pathology, the distribution of subjects were tabulated [Table 1] wherein degenerative disc disease [Figure1] was present in majority of cases amounting to 286(78.1%) subjects. Seronegative spondyloarthropathy [Figure2] was seen in 28(7.7%), Spondylolysis/listhesis in 25(6.8%), infective spondylodiscitis [Figure3] in 19(5.2%), Scoliosis in 12(3.3%), Congenital/ developmental causes [Figure4] in 5(1.4%), Mass/neoplastic [Figure5] in 4(1.1%), Scheuermann's disease [Figure6] in 2(0.5%) and other miscellaneous causes like leukemia, severe anemia with red marrow reconversion in 10(2.7%) subjects.

Majority of pathologies involved L4-L5 level (66.7 %, n=244), followed by L5-S1 (55.7%, n=204), L3-L4 (23%, n=84)), L2-L3 (9.3%, n=34), L1-2 (4.9%, n=18), D12 – L1 level (3%, n=11), and S1-S2 was least affected site (1.4%, n=5) in study subjects.

Protrusion was seen in maximum number (n=155) of subjects, followed by disc bulge (n=154) and extrusion in 60 subjects. Clinically significant spinal canal/ foraminal stenosis was found in 128 subjects. Annular fissure was noted in 102 patients, and Schmorl's nodes were noticed in 14 of all the patients.

DISCUSSION

Low backache is a difficult condition to effectively treat and continues to affect millions of people every year.[9] Back pain related disability has significant socioeconomic consequences due to consumption of health care resources and loss of economic productivity.[10] LBA encompasses three distinct components: axial lumbosacral, radicular, and referred pain.[9]

The gender wise distribution of patients coincides with that of study reported by Nara RK et al,[11]with more prevalence among male subjects. ShrinuvasanS et al,[12] also observed that LBA is more prevalent in males. Contrary to these studies, Kohat AK et al,[13] reported females had more disability compared to males.

On distribution of study subjects according to MRI findings, it was found that there were 325 (88.8%) subjects with abnormal findings and 41(11.2%) subjects were normal. In a comparable study by vanRijn JC et al,[14] 74% patients had abnormal findings on MRI on the symptomatic side. In a comparable study by ShrinuvasanS et al,[12] MRI did not show any abnormality in lumbar spine in 24 cases(10.2%).

The present study evaluated the various non traumatic causes of LBA in young adults and their prevalence on basis of MRI and it was found that degenerative disc disease was present in n=286(78.1%) subjects, seronegative spondyloarthropathy in n=28(7.7%) subjects, spondylolysis/listhesis in n=25(6.8%) subjects, infective spondylodiscitis was present in n=19(5.2%) subjects, mass/neoplastic in n=4(1.1%) subjects, scoliosis in n=12(3.3%) subjects, Scheuermann's disease in n=2(0.5%) subjects, congenital causes were present in n=5(1.4%) subjects and other miscellaneous causes like leukemia, severe anemia with red marrow reconversion in n=10(2.7%) subjects [Table 1]. In a similar study by ShrinuvasanS et al,[12] the common causes for LBA are disc herniations (including disc protrusion – 39.6%, disc bulge – 35.3%, disc extrusion – 7.2%) accounting to total 82.1%, followed by normal study (10.2%), infections (2.1%), and neoplasms (1.7%).

The present study aimed to correlate the clinical presentation with the MRI findings and to evaluate relevance of MRI findings in making appropriate diagnosis and its influence on effective management. Our study revealed L4-L5 level to be the most common site of disc herniation. Our study results are similar with those of Kohat AK et al,[13] and SathishBabu Set al,[15] where L4-L5 level was the commonest site of degenerative disc changes.

Persistent LBA may be the only presenting symptom in some serious conditions such as spondylitis/ spondylodiscitis, primary vertebral or intradural neoplasms. Pelvic or lower abdominal pathologies may also manifest solely with LBA. In our study we found MRI has high sensitivity in cases of infective spondylitis/spondylodiscitis and neoplastic lesions of the spine. MRI is highly sensitive in detecting and differentiating various etiologies such as degenerative changes, infective lesions, tumors, congenital or developmental disorders and many other pathologies of the spine. Disc herniation and other degenerative changes are the most common abnormalities found in MRI of cases with LBA.

CONCLUSION

MRI with its inherent high soft tissue contrast resolution, multiplanar capability and lack of ionizing radiation remains invaluable modality in evaluation of LBA especially in disc and marrow pathology. Developmental or Congenital pathologies are also best diagnosed on MRI. MRI LS spine is also the initial imaging technique of choice in complicated LBA for detecting "red flag" diagnosis, replacing X ray, conventional myelography and CT.

REFERENCES

1. Jarvik JG, Hollingworth W, Martin B, Emerson SS, Gray DT, Overman S et al. Rapid magnetic resonance imaging vs radiographs for patients with low back pain: a randomized controlled trial. JAMA. 2003Jun 4;289(21):2810-8

ISSN (O): 2687-5365; ISSN (P): 2753-6556

2. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019 Global Health MetricsLancet2020;396:1204–22
3. Andersson G. Epidemiological features of chronic low back pain. Lancet. 1999;354:581-85.
4. Atlas SJ,DeyoRA. Evaluating and managing acute low back pain in the primary care setting. J Gen Intern Med. 2001;16:120– 31.
5. Kinkade S. Evaluation and treatment of acute low back pain. Am Fam Physician. 2007;75(8):1181–88.
6. GoertzM,ThorsonD,Bonsell J. Adult acute and subacute low back pain. Institute for Clinical Systems Improvement; 2018.
7. Modic T.Michael, Jeffrey S.Ross. Lumbar Degenerative Disk Disease. Radiology2007:245,43-61.
8. Thawait S, Marcus M, Morrison W, Klufas R, Eng J, Carrino J. Research synthesis: whatis the diagnostic performance of magnetic resonance imaging to discriminate benign from malignant vertebral compression fractures. Systematic review and meta-analysis. Spine2012;37:E736–E744.
9. Urits I, Burshtein A, Sharma M, Testa L, Gold PA, Orhurhu V, Viswanath O, Jones MR, Sidransky MA, Spektor B, Kaye AD. Low back pain, a comprehensive review: pathophysiology, diagnosis, and treatment. Current pain and headache reports. 2019 Mar;23(3):1-0.
10. Brinjikji W, Diehn FE, Jarvik JG, Carr CM, Kallmes DF, Murad MH, Luetmer PH. MRI findings of disc degeneration are more prevalent in adults with low back pain than in asymptomatic controls: a systematic review and meta-analysis. American Journal of Neuroradiology. 2015 Dec 1;36(12):2394-9.
11. Narra RK, Ray V, Prasad JB, Putcha A. MRI Evaluation of Non Traumatic Causes of Low Backache:. International Journal of current Medical and Applied sciences 2017, 14(3),151-157.
12. Shrinuvasan S, Chidambaram R. Evaluation of low back pain with low field open magnetic resonance imaging scanner in rural hospital of Southern India. J Neurosci Rural Pract. 2016 Jul-Sep;7(3):368-73.
13. Kohat AK, Kalita J, Ramanivas S, Misra UK, Phadke RV. Clinical significance of magnetic resonance imaging findings in chronic low backache. The Indian journal of medical research. 2017 Jun;145(6):796.
14. Kim JH, van Rijn RM, van Tulder MW, Koes BW, de Boer MR, Ginai AZ, Ostelo RW, van der Windt DA, Verhagen AP. Diagnostic accuracy of diagnostic imaging for lumbar disc herniation in adults with low back pain or sciatica is unknown; a systematic review. Chiropractic & manual therapies. 2018 Dec;26(1):1-4.
15. SathishBabu S, Vinod S, AnuPriya JT. Application of MRI in the Evaluation of Low Backache.2017

ISSN (O): 2687-5365; ISSN (P): 2753-6556