

MRI As an Imaging Modality in Detection of Pathologies Causing Low Back Pain

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Abstract: Low back pain (LBP) is a typical issue including the spinal vertebrae and back muscles. LBP might be categorized into severe (0-6 weeks), subacute (6-12 weeks), and persistent (> 12 weeks) based upon the period of disease. The aim of this study was to answer if MRI modality technique able to detect the different pathological causes of Lower Back Pain (LBP). Furthermore, we wanted to evaluate the efficiency of MRI as a diagnostic procedure that could solve many unknown causes behind persistent LBP. We performed a comprehensive search for articles describing relevant imaging findings by using MEDLINE and EMBASE. To identify studies on MRI modality imaging of diagnosis of lower back pain disorders, we searched 3 databases through October 2016: Ovid MEDLINE, Ovid EMBASE, and the Web of Science. Ovid MEDLINE and Ovid EMBASE use controlled vocabulary. EMBASE was searched from 1988 to 2016; and MEDLINE was searched from 1946 to 2016. MRI is the basic imaging method for spotting disc pathology due to its benefit of absence of radiation, multiplanar imaging ability, exceptional back soft-tissue contrast and exact localization of intervertebral discs changes. Lumbar disc degeneration is the most typical reason for low neck and back pain. Males are more regularly impacted to the disc degeneration than ladies. Numerous levels of the disc participation are seen per individual. Annular disc tear, disc herniation, disc extrusion, constricting of back canal, constricting of lateral recess, compression of neural foramen, facet arthropathy and ligamentum flavum thickening prevails, disc participation and spondylolisthesis are less typical.

Keywords: Ovid MEDLINE, Low back pain (LBP), EMBASE.

1. INTRODUCTION

Low back pain (LBP) is a typical issue including the spinal vertebrae and back muscles. LBP might be categorized into severe (0-6 weeks), subacute (6-12 weeks), and persistent (> 12 weeks) based upon the period of disease. The life time occurrence of LBP has actually been reported to be 70- 85% ⁽¹⁾. Intense LBP is among the most typical conditions experienced in medical care. When intense neck and back pain is related to neurologic signs, then a substantial workup is required to try to find causes such as herniated intervertebral disk, back stenosis, and cauda horse syndrome, which represents just 5% of intense pain in the back cases ⁽²⁾.

The causes of LBP are unidentified; existing tests cannot determine a pathological cause for the pain in a minimum of 85% of cases ⁽³⁾. That is, in 85% of cases, even when the most comprehensive screening is performed, no evident cause can be developed. For this factor, such LBP is now typically described non-specific low pain in the back. Our failure to dependably determine pathology has actually triggered various hypotheses worrying the reason for LBP, consisting of minimized trunk extensor endurance, ⁽⁴⁾ mental distress, ⁽⁵⁾ hamstring inflexibility, ⁽⁶⁾ bad muscle control of the trunk, ⁽⁷⁾ bad posture, ⁽⁸⁾ and low body mass ⁽⁸⁾.

MRI reveal a wealth of pathologic and structural information, however the uniqueness of both methods for identifying the reason for low neck and back pain is low⁽⁹⁾. Plain radiographs can likewise offer details on degenerative modification⁽¹⁰⁾, however intrusive strategies such as joint injections and intriguing discography are hard to differentiate the unpleasant structure from the asymptomatic.

Previous research studies have actually revealed that, based upon magnetic resonance imaging (MRI) scans, disc degeneration, quantity of disc herniation, nerve root compromise and high strength zones can be categorized with excellent to outstanding dependability^(11,12). Element joint osteoarthritis can likewise be categorized based upon axial MRI scans of the back spinal column, although just with moderate dependability⁽¹¹⁾.

The aim of this study was to answer if MRI modality technique able to detect the different pathological causes of Lower Back Pain (LBP). Furthermore, we wanted to evaluate the efficiency of MRI as a diagnostic procedure that could solve many unknown causes behind persistent LBP.

2. METHODOLOGY

We conducted a Systematic review according to the Guidelines:

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3. RESULTS AND DISCUSSION

We have identified several studies that stated, MRI is advised in patients with progressive or extreme neurologic deficits or with major hidden conditions, such as vertebral infection, cauda horse syndrome, or cancer with spine compression⁽¹³⁾.

Some recognized research studies^(14,15) revealed, in patients providing with intense neck and back pain with indications or signs of herniated disk or a systemic disease, MRI or CT is seldom shown other than in patients with a strong suspicion of cancer or infection or cauda horse syndrome based upon their history and health examination^(14, 15). Many patients with herniated disk enhance with conservative treatment. As revealed by a couple of small research studies, recovery and regression takes place in herniated part of the disk with time, as seen on serial MRI⁽¹⁵⁾. A small number of patients with considerable pain or neurologic deficit after 6 weeks of conservative treatment will need an MRI or CT in factor to consider of surgery⁽¹⁵⁾.

Other consisted of research study⁽²⁾ recommended that MRI does not need radiation direct exposure and offers much better visualization of soft tissue and spine canal, and hence chosen over CT⁽²⁾. This research study revealed that regular innovative imaging is likewise not associated with better patient results. Numerous radiographic problems are discovered with MRI and CT that are inadequately related with the signs and in some case such incidental findings results in unneeded extra workup or intervention. MRI research studies recognized 22-40% of grownups with herniated disk, who are asymptomatic and pain totally free, however one research study discovered 81% of such asymptomatic people with a bulging disk (**Figure.1**)⁽²⁾. Therefore, a MRI needs to not be purchased to assess for the existence of a herniated disk as a preliminary action in the diagnosis as it is more frequently an incidental finding and might not be the reason for pain. A preliminary conservative method is more clinically proper and economical in severe low pain in the back for the very first 4-6 weeks. The MRI ends up being better for assessing patients with persistent radicular symptoms despite conservative treatment⁽²⁾.



Figure.1: MRI of disk bulge at L5-S1 ⁽²⁾

One study ⁽⁹⁾ showed that MRI has the capability to identify modifications in the water material of biological tissues, and can produce extremely detailed images. Problems seen on MRI of the back spinal column of CLBP patients, nevertheless, are typically seen in asymptomatic people ⁽⁹⁾. Morphologic modifications seen in MRI images cannot be utilized to forecast the ultimate incident of CLBP ⁽¹⁶⁾. On the other hand, in a research study of 40-year-old patients, a lot of degenerative disc problems seen on MRI were reasonably related to CLBP ⁽¹⁷⁾. Using MRI is typically accepted where growth, infection, deficiency fracture, or disc protrusion is thought, however its usage as a screening tool for CLBP is arguable, offered its expense and intricacy. These concerns have to be thought about on a case-by-case basis, as early diagnosis and suitable treatment will decrease the suffering connected with CLBP, and result in significant monetary cost savings. CLBP is pricey for lots of factors, consisting of the loss of work efficiency, the requirement for extended medical management, and the requirement for long-lasting neighborhood assistance ^(16,17).

MRI is especially great for illustrating internal disc morphology. A dehydrated, deteriorated disc, looking like a low or dark signal on T2-weighted MRI, is typically considered to be the source of pain by the patient and clinician alike (**Figure.2**). This finding, which is easily evident to casual evaluation of an MRI scan, should be treated with care, as it is frequently seen in asymptomatic people. Radial tears remain in truth typical findings on MRI, and are of low diagnostic worth ⁽¹⁸⁾. Intrusive methods such as intriguing discography are needed to validate the connection in between morphologic modifications seen on MRI and an uncomfortable disc.

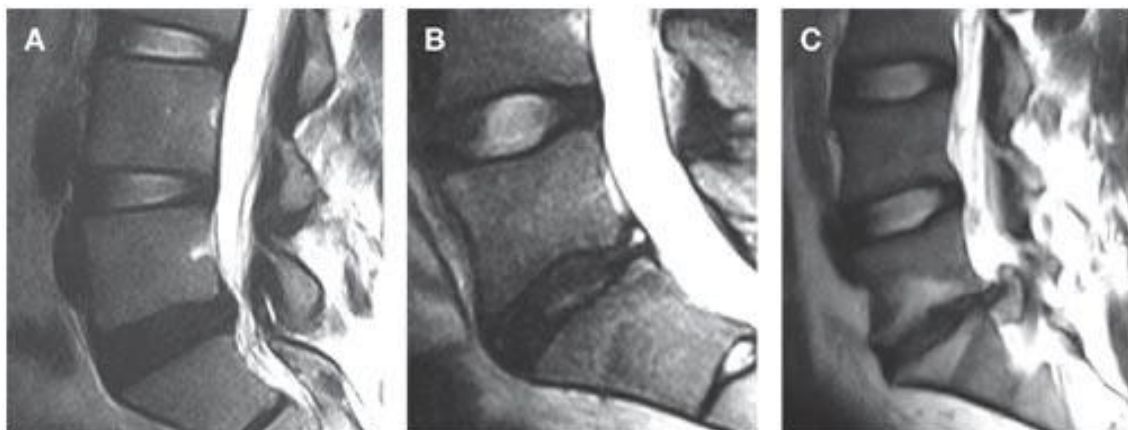


Figure.2: Identification of degenerative changes on MRI of the lumbar spine.

(A) Sagittal MRI of the lumbar spine demonstrating a desiccated or dark L5/S1 disc. (B) Sagittal MRI of the lumbar spine demonstrating a high-intensity zone in the posterior annulus of L5/S1. (C) Sagittal MRI of the lumbar spine demonstrating advanced degenerative changes in the L5/S1 disc, including Modic end-plate changes and a posterior disc protrusion ⁽¹⁸⁾.

We Identified large cross-sectional and observational study ⁽¹⁹⁾, the period of the research study was 2 months from 1st November 2013 to 31st December 2013. An overall 109 patients of back disc degeneration were detected on 1.5 Tesla MRI makers. All the observation was done by 3 Radiologists. Patients in between 17 to 80 y of the age with low neck and back pain were consisted of in the research study after getting a spoken permission. Patients with the history of injury, prior surgery, back infections, active malignancy, pregnancy, cervical spinal column participation, age < 17 y and > 80 y were omitted from the research study ⁽¹⁹⁾. The following MRI findings were kept in mind: Schmorl's nodes present or not (**Figure.3**), reduced disc height as compared with the upper and lower vertebral levels.

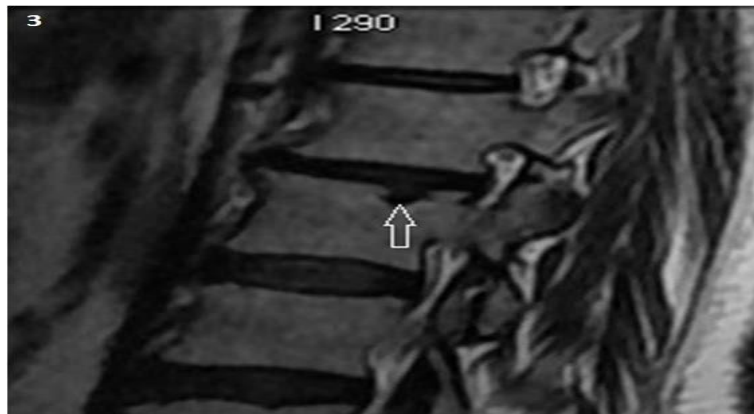


Figure.3: Sagittal T2 WI shows Schmorl's node at the superior aspect of L2 vertebral body (white arrow) ⁽¹⁹⁾

Other finding in this research study ⁽¹⁹⁾ disc desiccation which is a typical degenerative modification of intervertebral discs, on MRI imaging, the disc loses its main high T2 signal ⁽¹⁹⁾ (**Figure 4**).

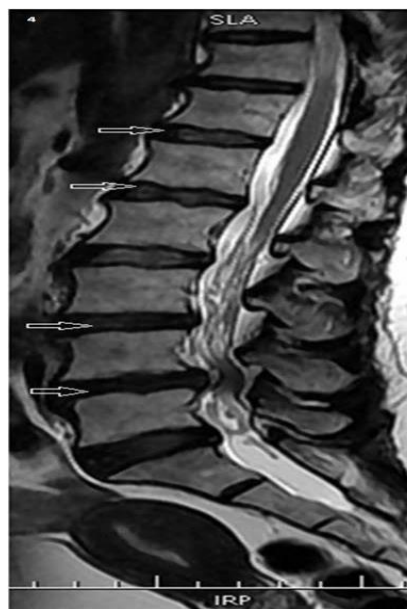


Figure.4:T2 Weighted Sagittal MR Image: Lumbar Disc Desiccations(white arrow) ⁽¹⁹⁾

Other cause of LBP, Annular tear which is also called annular fissure and is a separation in between annular fibers, avulsion of fibers from vertebral body insertion or break through fibers including several layer of the annular lamella. Tear in the disc is viewed as hyperintense on T2 Weighted images. Annular tear is more categorized in accordance with axial area into: central/medial, paramedian/lateral recess, extra-foraminal and foraminal/subarticular (Figure.5). Subarticular or foraminal disc herniation typically really bothersome for the patient due to the fact that compression of a 'Dorsal Root Ganglion'. Extra-foraminal is really unusual ⁽¹⁹⁾.

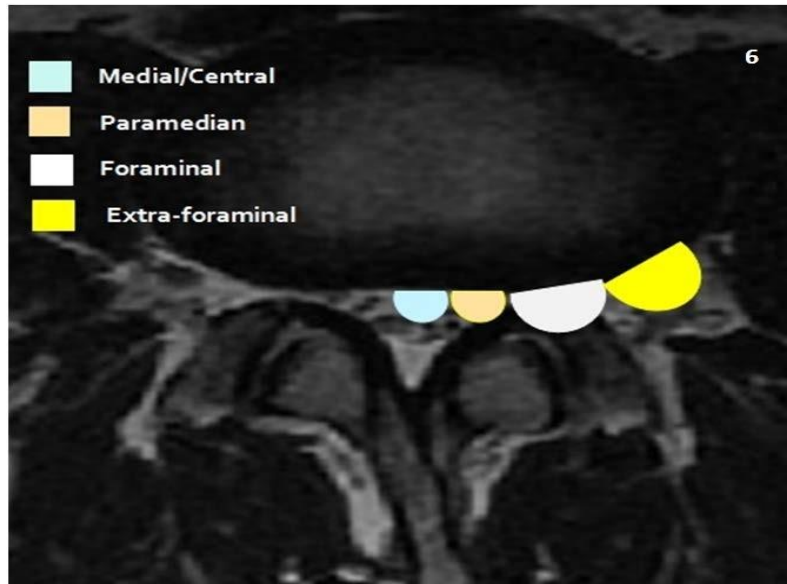


Figure.5: Axial T2 Weighted MR Image for axial localization: Medial/Central, Paramedian, Foraminal & Extra-foraminal ⁽¹⁹⁾

In other included study ⁽²⁰⁾, Ligamentum flavum thickening was determined on the axial image, perpendicular to the spine canal axis and parallel to the lamina, where ligamentum flavum were seen along their whole length & measurement were taken at the half length of ligament flavum. Inning accordance with Park et al. ⁽²⁰⁾ a mean density of the ligamentum flavum of 4.44 mm in the patients with the spine canal stenosis identified as thickened and 2.44 mm density in the control group. they had actually identified a > 4 mm ligamentum flavum thickening as thickened (**Figure 6**).

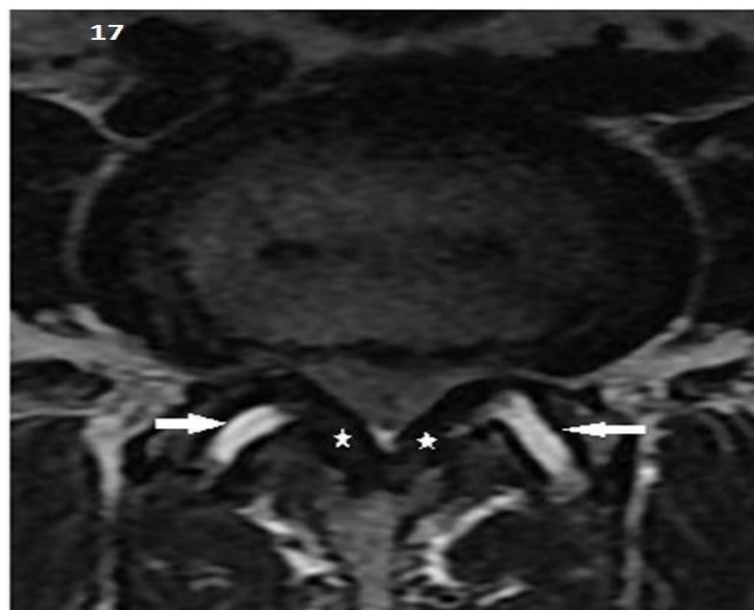


Figure.6: Axial T2 Weighted MR Image: Bilateral ligamentum thickening (solid white star). However facetal joints appear normal(white arrow) ⁽²⁰⁾

4. CONCLUSION

MRI is the basic imaging method for spotting disc pathology due to its benefit of absence of radiation, multiplanar imaging ability, exceptional back soft-tissue contrast and exact localization of intervertebral discs changes. Lumbar disc degeneration is the most typical reason for low neck and back pain. Males are more regularly impacted to the disc degeneration than ladies. Numerous levels of the disc participation are seen per individual. Annular disc tear, disc herniation, disc extrusion, constricting of back canal, constricting of lateral recess, compression of neural foramen, facetar arthropathy and ligamentum flavum thickening prevails, disc participation and spondylolisthesis are less typical.

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