

MAGNETIC RESONANCE IMAGING OF BACK PAIN IN YOUNG POPULATIONHiral Hapani¹, Jay Hapani², Anjana³, Jagruti⁴**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: Low back pain in young patients represents an area of particular challenge and importance to referring physicians. Although plain radiography remains initial imaging tool, MRI due to its inherent high quality soft tissue contrast resolution, lack of ionizing radiation and rare requirement of contrast media remains invaluable modality to evaluate back pain in young patients. **AIMS:** The role of MRI in evaluation of various lesions of spine, inter vertebral discs and spinal canal in young patients (3–17 years of age). **MATERIALS & METHODS:** This was a prospective study done from on young patients (total 35 patients) who presented with back pain are evaluated with MRI. Patients advised MRI spine for complaints other than back pain and uncooperative patients were excluded from the study. The study was performed using GE 1.5T and Siemen's 3.0T MRI machines. **RESULTS:** Although significant number of children and adolescents who presented with back pain did not show any significant abnormality on MRI, the most common etiology in this study was disc disease and herniation. This was immediately followed by second most common cause as sacroilitis and spondylolysis with or without listhesis. Scoliosis, spinal trauma and infective etiologies were third most common cause of back pain in this study. Neoplastic conditions and congenital anomalies were found among the rare causes of back pain in children and adolescents in our study. **CONCLUSION:** Back pain is common in children and adolescents and its incidence increases with age. MRI remains main stay of spinal imaging to evaluate various pathologies of vertebrae, bone marrow, discs, ligaments, spinal cord and sacroiliac joints.

KEYWORDS: MRI, back pain, young patients.

I. BACKGROUND: Back pain in young patients is not uncommon and requires systematic imaging work up. MRI of spine remains the key investigation to identify various causes of back pain like scoliosis, disc herniation, spondylolysis, sacroilitis, traumatic as well as infective causes and rare etiologies like neoplastic and congenital conditions. MRI plays an essential role in framing diagnostic algorithm for young patients and forms fundamental basis for planning and monitoring therapy.

II. AIMS: To define role of MRI in evaluation of various causes of back pain in young patients (3 – 17 years of age). To provide guidelines for clinicians about lesions in spine, intervertebral disc and spinal canal. To assess treatment and prognosis in follow up patients.

III. MATERIALS AND METHODS: In this study total 35 patients were examined. This was a prospective study done on young patients who presented with back pain and evaluated with MRI. Patients advised MRI spine for complaint other than back pain and uncooperative patients were excluded from the study. The study was performed using GE 1.5 T and Siemen's 3.0 T MRI machines.

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IV. RESULTS: Majority number of children and adolescents who presented with back pain did not show any significant abnormality on MRI, but the most common etiology in this study was disc disease and herniation. The second most common causes found were sacroilitis and spondylolysis with or without listhesis. Scoliosis, spinal trauma and infective etiologies were third most common cause of back pain in this study. Neoplastic conditions and congenital anomalies were found rare causes of back pain in our study.

Figure 1: Chart showing causes of back pain in young population. The most common cause of back pain was disc herniation and neoplastic cause was the least common.

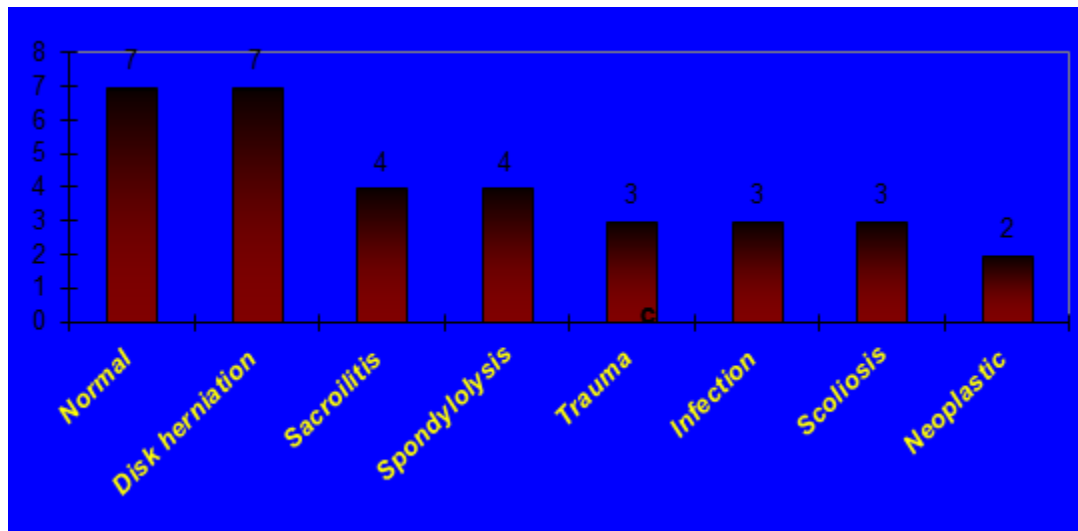


Fig. 1

V. DISCUSSION: Back pain in children and adolescents can be due to numerous causes like spinal trauma, alignment disorders like spondylolysis, scoliosis, disk herniation, infective spondylitis, sacroilitis, congenital deformity and neoplastic conditions. Among 35 patients, disc disease and herniation were found to be the leading cause of back pain in our study. Study done by Fain Gold et al found spondylolysis and listhesis as most common cause of back pain in young population. While disc herniation is prevalent in young athletes.⁽¹⁾

A. DISC HERNIATION: Majority of patients with disc herniation had preceding trauma as causative factor which is consistent with other studies⁽²⁾. MRI is versatile modality in assessing shape of spinal canal and spinal stenosis. Out of 7 patients; 4 patients demonstrated spinal stenosis secondary to disk herniation of which 3 had moderate and 1 had severe spinal stenosis. Axial sections at disc level were most helpful in assessing effect of disc herniation on spinal canal. However it is difficult to localize the cause of back pain in patients with disc herniation at multiple levels with MRI which is its limitation. ⁽³⁾

B. SPONDYLOLYSIS: Spondylolysis - a defect in pars interarticularis (weakest part of vertebra) was seen in 4 patients. The defect appears to be caused by continued stress that produced fracture and severe trauma is rarely known as described by Bezer et al ⁽⁴⁾.

C. SACROILITIS: Sacroilitis was found to be one of the common causes of inflammatory back pain in young patients. Common causes of sacroilitis include ankylosing spondylitis, reactive arthritis, psoriatic arthritis, arthritis related to inflammatory bowel disease, undifferentiated spondyloarthropathy and infective etiology. HLA B27 positivity, inflammatory back pain with MRI proven sacroilitis positively predicts spondyloarthropathy.⁽⁵⁾ On long term follow up of HLA B27 negative nonspondyloarthropathy patient with moderate unilateral sacroilitis is classified as undifferentiated sacroilitis.⁽⁶⁾

Despite the ESSG and NEW YORK criteria including plain film findings; the delay in diagnosis may be up to 9 years (7). Plain radiograph is used to confirm clinically suspected sacroilitis and investigation of choice for primary evaluation and follow up of patients with chronic alterations of sacroilitis.

However, MRI is now first investigation of choice for early detection of subchondral bone marrow edema which is the earliest signs of sacroilitis and of great help in planning subsequent patient management. STIR was found to be the excellent sequence for evaluating degree and extent of sub chondral bone marrow edema.

Figure 2: (A) shows hyperintense signal change in left sacroiliac joint on axial STIR Image signifies marrow edema suggests changes of left sided sacroilitis. (B) Image shows patchy areas of hyperintense signal change involving both sacroiliac joints on coronal STIR image suggests changes of bilateral sacroilitis.

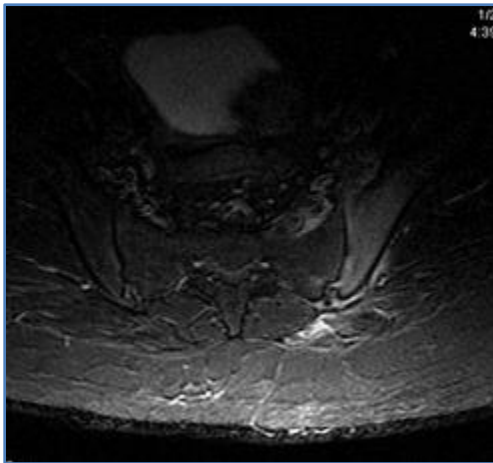


Fig. 2A

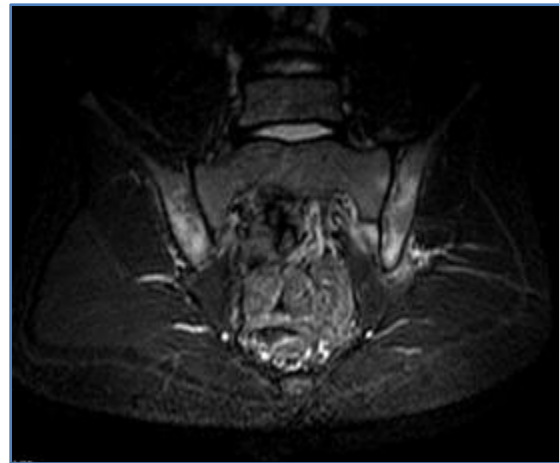


Fig. 2B

D. INFECTIVE SPONDYLITIS: MRI remains mainstay for evaluating patients with infective spondylitis. Koch's infection was found to be the most common cause of infective spondylitis. Classic imaging findings like marrow changes, endplate erosion, disc involvement, pre and paravertebral abscesses supports diagnosis of tuberculous infective spondylitis.

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Figure 3: (A) shows contrast enhanced MRI image of lumbar spine in axial plane shows well defined enhancing pre and paravertebral soft tissue collection. (B) Shows axial T1w image of lumbar spine ill-defined iso intense lesion involving intervertebral disc. (C) Shows axial T2w image of lumbar spine shows hyper intense pre vertebral collection with thin hypo intense rim and small epidural component. Above findings are typical of pre vertebral collection in tuberculous infective spondylitis.

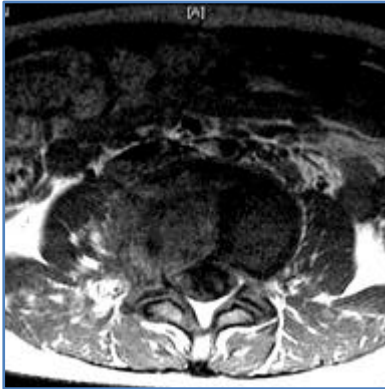


Fig. 3A

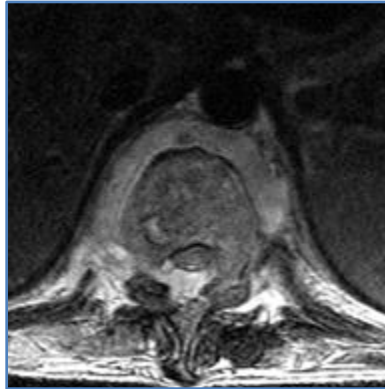


Fig. 3B

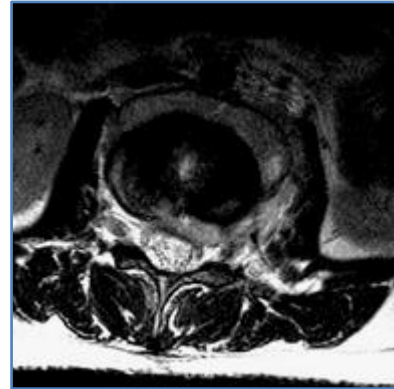


Fig. 3C

One study done by Jung et al, demonstrated that well defined paraspinal abnormal signal and thin and smooth enhancement of abscess wall are two most reliable MRI findings suggesting Tuberculous spondylitis⁽⁸⁾. Few patients were not willing for contrast study was one of limitation of our study.

Multiple vertebral involvements were demonstrated in two patients of this study. Involvement of multiple vertebrae suggesting tuberculous etiology, however single vertebral body involvement may also be seen with mycobacterial infection.⁽⁹⁾

E. SPINAL TRAUMA: Spinal trauma can cause excruciating back pain due to bony or neural injuries. MRI is very helpful in assessing vertebral marrow edema, ligamentous injury, disc integrity, spinal cord injury and evaluation of posterior element injury secondary to spinal trauma. The longitudinal ligament functions to maintain vertebral body alignment; failure of either ligament at any spinal level is indicative of instability.⁽¹⁰⁾

F. SPINAL NEOPLASMS: They are rare causes of back pain in children and adolescents⁽³⁾. Out of 35 patients, we found only two neoplastic conditions as causative of back pain like posterior epidural haemangioma and bony metastasis in a known case of Ewing's sarcoma. The extradural lesions were mainly situated posterolaterally because larger available space and lower resistance of posterior compartment of spinal cord.⁽¹¹⁾ Other causes of back pain in our study were – scoliosis and congenital spinal deformities like dorsal hemivertebra.

VI. CONCLUSION: In this study, we found that back pain is not uncommon in younger population and its incidence increases with age. Common causes of back pain like disc herniation, spondylolysis and sacroilitis are accurately diagnosed with MRI. Detailed evaluation of spinal trauma, spinal

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infections and neoplastic conditions is possible with MR imaging only. MRI remains the unique modality of choice to evaluate various pathologies of vertebrae, bone marrow, discs, ligaments, spinal cord and sacroiliac joints as cause of back pain.

VII. ILLUSTRATIONS:

Figure 4: Sagittal STIR image of lumbar spine shows anterior wedging with post traumatic compression fracture at dorso-lumbar junction with marrow edema and retro pulsed postero-superior fragment indenting thecal sac and impinging on conus medullaris. Diffuse hyper intense signal seen within conus on STIR image suggests cord contusion.

Figure 5: Sagittal STIR image of lumbar spine shows irregular destruction with marrow edema of L3 vertebra with hyper intense signal change in L3-4 disc with pre vertebral and anterior epidural collections suggests infective spondylitis.



Fig. 4



Fig. 5

Figure 6: Sagittal T1w image of this young boy shows multiple patchy ill-defined hypointense lesions in multiple cervical and dorsal vertebrae, suggesting multiple vertebral metastases in a known patient of Ewing's Sarcoma.



Fig. 6

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