ORIGINAL ARTICLE

MRI Study Of First 120 Cases Of Lumbo-Sacral Spine Done In HFRCMCH

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Abstract

MRI evaluation of first 120 cases of lumbo-sacral spine done in the first MRI Unit installed in Holy Family Red Crescent Medical College Hospital in 1996 was done to assess the disease pattern of lumbo-sacral spine in Bangladeshi Population with emphasis on Degenerative Lumbar Disc Disease. Among the 120 patients, 80 were male and 40 were female, ranging from 16 years of age to 75 years. 96% of the patient showed Degenerative Disc Disease with Disc Herniation in 70% and Disc Bulge in 62% cases, most commonly occurring in 3rd and 4th decades (53%). The L4-5 and the L5-S1 disc levels were more frequently involved. Male preponderance was noted.

Introduction

MRI was developed in the 1980's and has revolutionized the diagnosis and treatment for the patients suffering from low back pain. MR Imaging is generally considered to be the single best imaging study of lumbo-sacral spine. With the advent of MRI technology, good anatomic detail of the disc can be imaged[1].

MR Imaging of lumbar spine is the preferred imaging modality (next to x-ray) due to the following reasons:

1. Non-invasive procedure. 2. Multiplanar imaging capability. 3. Excellent visualization of the spinal anatomy. 4. Detection of pathology due to signal intensity changes[2,3].

Discussion

Aim of this study was to analyze the disease pattern of lumbar spine in our country in patients suffering from low back pain, acute or chronic.

Low back pain is one of the most common conditions and one of the leading causes of physician visit. Four out of five people will experience low back pain, mild to severe, sometime in their lives. After common cold, low back pain is the most frequent cause morbidity in adults under the age of 45.

Causes of low back pain: 1. Congenital. 2. Traumatic. 3. Inflammatory. 4. Metabolic. 5. Degenerative. 6. Neoplastic.

Disc Anatomy: The intervertebral disc is a complex structure consisting of hyaline cartilage, fibrocartilage, mucopolysaccharide, and dense collagenous fibrous. The disc has three components (outer to inner): the cartilaginous endplate, nucleus pulposus, and annulus fibrosus. The cartilaginous endplate is a layer of hyaline cartilage covering most of the vertebral endplate. The cartilaginous endplate attaches firmly to the osseous endplate. The annulus fibrosus is a complex fibrous and fibrocartilaginous structure that consists of outer and inner rings. The outer ring contains the densest fibrous lamellae consisting almost exclusively of dense Type I collagen. The inner

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ring of the annulus fibrosus contains fibrocartilage. The nucleus pulposus is also composed of fibrocartilage (Type II collagen). The disc normally lacks innervation and vascularity.

The disc and the paired facet joints create a 3-Joint Complex at each vertebral motion segment. The joint complex allows for motion in flexion, extension, rotation and lateral bending.

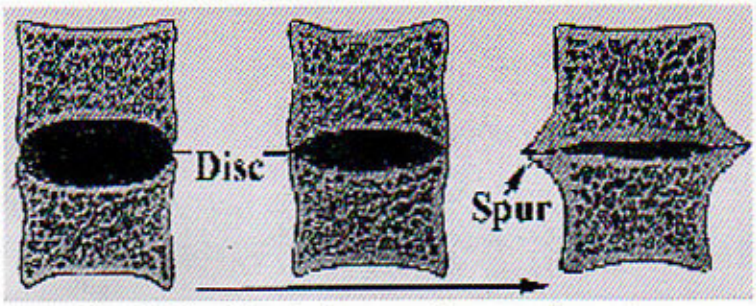


Fig-1. Disc dehydration, causing spur formation.

Degeneration of intervertebral disc is seen at autopsy in 97% of adults by 50 years. Patient with degenerative disc disease may remain asymptomatic. Disc degeneration is part of the natural process of aging and does not necessarily lead to low back pain. Approximately 30% of 30 year olds have signs of disc degeneration on MRI scans even though they have no back pain symptoms[4,5]. By age 60, that figure is over 90%. Not all degenerated discs that are seen on MRI scans are pain generators. In a series of 600 autopsy specimens, Miller, et al. showed that 90% of all lumbar discs had evidence of degeneration in individuals by the age of 50 years. Causes of disc degeneration are not clearly known. There is loss of water content in the degenerated disc from 80-90% in normal disc to 70% in degenerated disc. This causes cracks and fissures in the nucleus pulposus. The disc is diminished in height. There is disruption of annulus, resulting in disc bulging and disc herniation. Reduction of disc height causes rostro-caudal subluxation of facet joints, which subsequently suffers hypertrophic changes causing foraminal stenosis.

The MR appearance of vertebral marrow changes (Endplate changes) associated with degenerative disc disease are usually categorized in three groups:

1. Type I endplate changes represent vascularized marrow and are seen as low signal intensity on T1-weighted images and high signal intensity on T2-weighted images.
2. Type II changes represent more chronic discogenic disease with proliferation of fatty marrow in the vertebral body adjacent to the degenerating disc and are characterized by high signal intensity on T1-weighted images and isointense or slightly hyperintense on T2-weighted images.
3. Type III changes represent dense bone devoid of marrow and are dark on T1-weighted images and T2-weighted images.

Materials and Method

First 120 patients having varied clinical features predominantly low back pain were studied in the MRI section of the Radiology and Imaging Department of Holy Family Red crescent

Medical College Hospital using 0.5T Superconductive MRI Machine during the year of 1996.

Imaging Protocols Used:

	TE/TR	Slice Thickness/Pitch
Sagittal	SE (T1)	500/20	5mm/1mm
Sagittal	SE (T2 & PD)	2000/20/70	5mm/1mm
Axial	SE (T1)	600/20	5mm/1mm
Corona	SE (T1)	500/20	4mm/1mm

Two Radiologists evaluated MR Images. MRI contrast medium (Magnevist – Gadopentate Dimeglumine) was used whenever it was necessary, particularly if there was suspicion of inflammatory or neoplastic spinal disease. In post-operative spine, contrast medium was used routinely.

Discs showing low signal intensity T2 weighted images were ranked as dehydrated/degenerated discs. Concentric smooth circumferential expansion of the disc beyond the confines of the end plates was ranked as disc bulge. Protrusion of the disc material beyond the margins of the vertebral end plates was ranked disc herniation.

Fig-2: Sagittal T1 weighted Image.
Arrow heads: Disc Bulge.

Disc dehydration was assessed on sagittal T2 weighted images. Facet and flaval hypertrophies were assessed on axial T1 weighted images.

Results

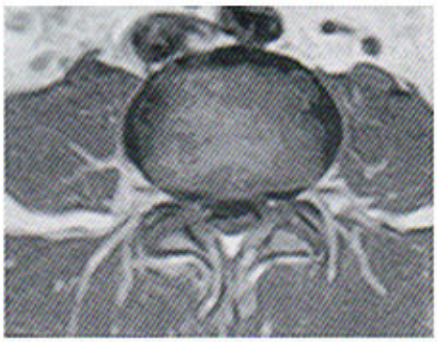
115 of 120 patients showed evidences of degenerative disc disease (96%). Among 115 patients (77 male and 38 female) of ages ranging from 16 years to 75 years, 225 lumbar discs showed various degrees of low signal intensity (hypointensity) on sagittal T2 weighted images (in 98 patients). Disc dehydration were found in 65% of male and 35% of female patient.

Table I-MRI Findings.

Congenital Abnormality	3	2.5%
Traumatic/Benign Compression	2	2%
Infective (TB)	3	2.5%
Degenerative Disease	115	96%
Neoplastic	8	6.5%
Post-Operative	65%	

Fig-3: Sagittal T2 weighted Image.
Arrow heads: Disc Bulge.

Fig-4: Axial T1 weighted Image.
Arrows: Disc Herniations.



3 cases had congenital anomalies (Meningocele-1, Arachnoid Cyst-1, Sacral Canal Cyst-1). 2 cases of compression fracture were seen. Tubercular spondylitis with discitis was found in 3 patients. Neoplasm was found in 8 cases - Neurogenic tumour in 4 cases and mets in 2 cases. Other spinal neoplasms were haemangioma, ependymoma and astrocytoma. 6 post-operative cases were seen with evidences laminectomy/fenestraton, discectomy, recurrent disc herniation, epidural fibrosis/scarring etc.

Fig-6: Sagittal T2 Weighted Image.

Fig-5: Axial T2 weighted Image.
Arrows: Disc bulges.

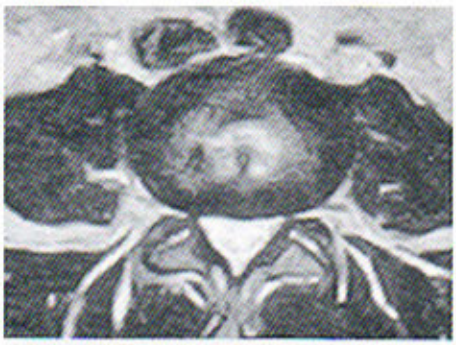


Table II-Degenerative Lumbar Disc Disease

Disc Desiccation	98	85%
Reduced Disc H ight	44	38.30%
Disc Bulge	72	62.5%
Disc Herniation	81	70.5%
Osteophytes	68	60%
Straightening of Lordosis	86	74.5%
Vertebral Marrow Changes	08	6.5%
Lig. Flavum Hypertrophy	14	13%
Facet Hypertrophy	85	73%
Spondylolisthesis	05	4.2%

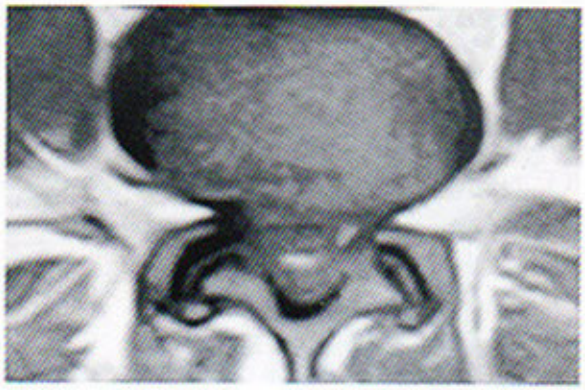


Fig-7: Axial T2 Weighted Image.

Table III-Degenerative Disc Disease – Age distribution.

Age-Group	No. of Patient
20-30	n=15 (13%)
30-40	n=35 (30%)
40-50	n=26 (23%)
50-60	n=23 (20%)
60+	n=16 (14%)

TableIV-Degenerative Disc Disease – Sex distribution.

	Total	Male	Female
Disc Desiccation	n=98	n=64 (82.5%)	n=34 (17.5%)
Reduced Disc Height	n=44	n=28 (63.6%)	n=16 (33.4%)
Disc Bulging	n=72	n=48 (66.7%)	n=24 (33.3%)
Disc Herniation	n=81	n=81 (64.2%)	n=29 (35.8%)

Conclusion

Degenerative lumbar disc disease contributes to about 96% of the lumbar spinal diseases. Major features of lumbar disc disease are – disc desiccation, reduced disc space height, osteophytes, facet changes, disc bulge and disc herniation. More than 50% of degenerative lumbar disc diseases occur in 4th and 5th decades of life. There is male preponderance. The lower lumbar discs (L4-5 and L5-S1 levels) are more frequently involved. Lumbar disc herniations are most common at L4-5 (40%) and L5-S1 (45%) levels.

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