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Original Research Article

Prevalence of Disc Degeneration in Lumber Spine in Young Adults using MRI

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Abstract:

Background: Degenerative changes are commonly found in spine imaging. Lumbar spine disc degenerative disease (DDD) has been proven to be the most common cause of low back pain which causes musculoskeletal disability. Magnetic resonance imaging (MRI) allows detailed assessment of all components of the lumbar spine and help in the assessment of abnormalities that may be associated with disc degeneration. The aim of the present study was to assess prevalence of disc degeneration in lumbar spine in young adults using MRI.

Material and Methods: The study was planned in the Department of the Orthopaedics in Nalanda Medical College and Hospital, Patna from august 2018 to July 2019. The present retrospective study was done to assess MRI of lumbar spine images of all patients presenting with chronic low back pain over the period of 1 year. 312 cases with age 19-25 years with DDD were included in the study. The protocol for scanning the lumbar spine using Basda - PI (2009) 0.35 Tesla MRI machine was used. Studies consisted of five spin echo pulse sequences. A slice thickness of 5 mm with 1 mm gap was used for all sequences. The MRI images were evaluated and the MRI findings were entered into a predesigned data sheet. Patient's demographic data was also entered into the data sheet. Statistical analysis was done using SPSS 21 software. The significance level was set at 0.05.

Results: In the present study total males suffering from disc degeneration disease were 129 males and females were 183. In both males and females nerve root compression was prevalent. Disc herniation was common in males but in females disc degeneration was common. In age group 19-21 years disc herniation was common and in age group 22-24 years nerve root compression was common. L1/L2 was affected more in disc degeneration. L2/L3, L3/L4, L4/L5, L5/S1 were affected more in nerve root compression.

Conclusion: Our study concluded that in both males and females nerve root compression was prevalent. In age group 19-21 years disc herniation was common and in age group 22-24 years nerve root compression was common. L1/L2 was affected more in disc degeneration. L2/L3, L3/L4, L4/L5, L5/S1 were affected more in nerve root compression.

Keywords: MRI, Disc Degenerative Disease, Lumber Spine.

Introduction

Low back pain is a common problem in the young as well as the elderly population. [1,2] Degenerative disc disease, facet joint arthropathy, spinal canal stenosis and disc herniation are often implicated as the causes of back pain. However, features of degeneration in the spine are also identified in the asymptomatic individual, and are considered a part of normal aging. [3] Advanced imaging (MR imaging and CT) is increasingly used in the evaluation of patients with low back pain. [4] Findings such as disk degeneration, facet hypertrophy, and disk protrusion are often interpreted as causes of back pain, triggering both medical and surgical interventions, which are sometimes unsuccessful in alleviating the patient's symptoms. [5] Magnetic resonance imaging (MRI) allows a complete evaluation of static and dynamic factors related to degenerative disease of the spine and is useful in diagnosing the different aspects of spine degeneration.[6] The aim of the present study was to assess prevalence of disc degeneration in lumbar spine in young adults using MRI.

Material and Methods

The study was planned in the Department of the Orthopaedics in Nalanda Medical College and Hospital, Patna from August 2018 to July 2019. The present retrospective study was done to assess MRI of lumber spine images of all patients presenting with chronic low back pain over the

period of 1 year. 312 cases with age 19-24 years with DDD were included in the study. Before the commencement of study ethical approval was taken from the Ethical committee of the institute and informed consent was obtained from the patients. MRI images for individuals below the age of 18 years, pregnant females and those that have undergone surgical treatment for low back pain were excluded from the study. The protocol for scanning the lumber spine using Basda - PI (2009) 0.35 Tesla MRI machine was used. All patients were positioned supine on the scanning couch and a radiofrequency coil placed over patients' covering areas between the costophrenic angle and the iliac crest (region of the lumbar spine). Laser was aligned at midpoint between L1 and L3. Table was then moved under the magnet until patient was at its centre. Studies consisted of five spin echo pulse sequences:

- Coronal, sagittal, and axial localizers with a repetition time and echo time (TR/TE), field of view (FOV) of 352 cm × 352 cm
- T1-weighted sagittal images with TR/TE 400/20 ms, FOV 352 cm × 352 cm
- T1-weighted axial images with TR/TE 400/20 ms, FOV 352 cm × 352 cm
- T2-weighted sagittal images with TR/TE 3000/120 ms, FOV 352 cm × 352 cm
- T2-weighted axial images with TR/TE 3000/120 ms, FOV 352 cm × 352 cm.

A slice thickness of 5 mm with 1 mm gap was used for all sequences. The sagittal images covered the entire width of the spine including the neural foramina. The axial images were acquired parallel to the discs and covered the adjacent margins and endplates of the adjacent vertebral bodies. The MRI images were evaluated and the MRI findings were entered into a predesigned data sheet. Patient's demographic data was also entered into the data sheet. Statistical analysis was done using SPSS 21 software.

Results

In the present study total males suffering from disc degeneration disease were 129 males and females were 183. In both males and females nerve root compression was prevalent. Disc herniation was common in males but in females disc degeneration was common. In age group 19-21 years disc herniation was common and in age group 22-24 years nerve root compression was common. L1/L2 was affected more in disc degeneration. L2/L3, L3/L4, L4/L5, L5/S1 were affected more in nerve root compression.

Table 1: Distribution according to gender

Gender	N(%)
Males	129(41.34%)
Females	183(58.65%)
Total	312(100%)

Table 2: Distribution of degenerative imaging findings by gender

Findings	Gender	
	Male (n)	Females (n)
Disc degeneration	22	35
Disc bulge	13	21
Disc herniation	29	23
Canal stenosis	8	28
Nerve root compression	37	65
Type I Modic changes	9	4
Type II Modic changes	11	7
Total	129	183

Table 3: Distribution of degenerative imaging findings by age

Findings	Age	
	19-21 (n)	22-24 (n)
Disc degeneration	18	39
Disc bulge	21	13
Disc herniation	39	13
Canal stenosis	18	18
Nerve root compression	27	77
Type I Modic changes	5	6
Type II Modic changes	8	10
Total	136	174

Table 4: Distribution of degenerative imaging findings by disc level

Findings	Spine level				
	L1/L2	L2/L3	L3/L4	L4/L5	L5/S1
Disc degeneration	6	8	11	15	17
Disc bulge	2	4	6	14	8
Disc herniation	1	4	13	18	16
Canal stenosis	1	2	8	15	10
Nerve root compression	4	12	21	38	27
Type I Modic changes	1	2	4	4	2
Type II Modic changes	2	3	5	4	4
Total	17	35	68	108	84

Discussion

Increasing age is associated with increasing musculoskeletal symptoms and also incidence of low back pain. [7] However in our study, number of MRI performed in the younger age group. Degenerative disc changes is defined as presence of any or all of: desiccation, fibrosis, disc space narrowing, diffuse annular bulging beyond the disc space, extensive fissuring (i.e. numerous annular tears) and mucinous degeneration of the annulus, defects and sclerosis of the end-plates and vertebral apophyseal osteophytes. [8]

In the present study total males suffering from disc degeneration disease were 129 males and females were 183. In both males and females nerve root compression was prevalent. Disc herniation was common in males but in females disc degeneration was common. In age group 19-21 years disc herniation was common and in age group 22-24 years nerve root compression was common. L1/L2 was affected more in disc degeneration. L2/L3, L3/L4, L4/L5, L5/S1 were affected more in nerve root compression. Other studies with male predominance related to male susceptibility to disc degeneration arising from increased mechanical stress and injury. [9,10]

The prevalence of disc degeneration to young individuals could probably be explained as a result of a genetic predisposition; though, other factors such as repeated traumatic injuries and physical loading history can play a role in causing disc degeneration. [11]

The degenerative process within discs results in greater axial loading and increased stress on the vertebral body endplates.[12] Verma et al. [13] Kuisma et al. [14] found that Modic changes at L5/S1, especially Type 1 changes were common in patients with low back pain.

Kjaer *et al*. [15] reported that most degenerative disc abnormalities were moderately associated with low back pain.. Kjaer *et al*. [16] suggested that Modic changes constitute the crucial element in the degenerative process and the disc in relation to low back pain and clinical findings. They demonstrated that DDD on its own was a fairly quite disorder, where DDD with Modic changes was much frequently associated with clinical symptoms. Most authors agree that, among Modic changes, Type 1 changes are most commonly found in patients with low back pain [13,17]. Mitral *et al* found a positive trend between the evolution of Type 1 Modic changes into Type 2 changes and the improvement of pain symptom. In addition, they observed that patients in whom Type 1 changes increased were clinically worsened. [18]

Conclusion

Our study concluded that in both males and females nerve root compression was prevalent. In age group 19-21 years disc herniation was common and in age group 22-24 years nerve root compression was common. L1/L2 was affected more in disc degeneration. L2/L3, L3/L4, L4/L5, L5/S1 were affected more in nerve root compression.

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