

Compensation of MRI findings in asymptomatic patients with chronic low back pain

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Abstract

Objective: Chronic low back pain can originate from a number of constructs. It has a range of pathologies depending on multifactorial causes. In this study, we aimed to investigate in asymptomatic patients who compensation complaint of chronic low back pain in our outpatient clinic and demonstrate its for functionality in treatment planning.

Method: MRI results of 78 asymptomatic patients (46 males, 32 females) who complained of low back pain for at least 12 weeks between March 2016 - January 2017 were examined. During Magnetic Resonance Image (MRI) assessments, T1 and T2 weighted sagittal plane and transaxial images of the lumbar region (L1-S1) and radiology reports of these images were obtained for all patients. Degenerative disc disease, Bulging protrusion, Spinal canal stenosis and Nerve root compression re-evaluated and patients findings were assessed.

Results: There was no abnormality in the MRI results of 16 patients (20%) examined within the study criteria. Nerve root compression was detected in 17 patients (22%), spinal stenosis in 24 patients (30%) and disc degeneration or bulging in 57 patients (78%). There was no statistically significant difference in the incidence of pathologies by asymptomatic patients findings.

Conclusion: Chronic back pain is a disease that involves a wide range of pathologies. MRI scan provides detailed images to the clinician, it is difficult to make a specific diagnosis in the majority of patients with low back pain. Difficulty should be taken into account that the findings obtained by the clinician during assessment can also be seen in asymptomatic individuals.

Keywords: Low back pain, MRI, Asymptomatic

Introduction

Chronic low back pain is a health condition affecting most of the world population, most commonly between the ages of 30-50, which causes social and economic losses, and it affects about 23% of people in a certain time of their lives (1,2). Chronic low back pain can originate from a number of constructs such as nerve roots, muscles, intervertebral discs, and abdominal organs. It has a range of pathologies depending on multifactorial causes, including structural, somatic and psychological factors (3,4), Treatment aiming at biomechanical factors may be inadequate in some cases. Non-specific low back pain is diagnosed when the causes of pain could not be detected by currently available assessment and diagnostic tools and is defined as chronic back pain when the duration of low back pain is 12 weeks or

more (5). The knowledge that the correlation of imaging with symptoms is poor in patients with chronic low back pain is based on many studies. In many studies, magnetic resonance imaging revealed disc herniation and spinal stenosis in patients, with degenerative disc or bulging findings noted in more than 90% of patients (6,7,8). When clinical symptoms of these pathologies are examined, asymptomatic examination findings or findings caused by a number of intertwined problems are observed. In a study evaluating the results of magnetic resonance imaging (MRI) in patients without low back pain, Greenberg JO et al. reported 39% degenerative disc disorder with bulging, 18% disc protrusion or herniation as well as spinal stenosis, nerve root canal stenosis, osteophyte localized in vertebra corpus (9).

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MRI has been used for a long time in diagnosis of lumbar region pain. MRI shows not only pathological changes but also physiological changes caused by aging (10,11,12). Degenerative changes also describe physiological changes developing over time, rather than pathological changes in asymptomatic people. Previous studies in the literature reported a high percentage of disk degeneration in asymptomatic patients and a few studies focused on changes in the lumbar region, and there is no study investigating the changes in patients with chronic low back pain. In this study, we aimed to investigate existing changes in asymptomatic patients who had undergone lumbar MRI assessment at least once with the complaint of chronic low back pain in our outpatient clinic and demonstrate its functionality in treatment planning.

Material and method

MRI results of 78 asymptomatic patients (46 males, 32 females) who complained of low back pain for at least 12 weeks between March 2016 - January 2017 were examined. All patients included in the study were assessed and their findings deemed as normal examination findings are given in Table 1. Patients who did not meet normal lumbar examination findings as a result of physical examination were not included in the study. Also patients with a past medical history of fracture, surgical intervention in lumbar region, metabolic diseases that may lead to systemic disorder or genetic diseases (chronic renal failure, osteoporosis, achondroplasia, osteogenesis imperfecta, osteopetrosis, etc.) and those with a history of malignancy with potential for metastasis were not included in the study.

During MRI assessments, T1 and T2 weighted sagittal plane and transaxial images of the lumbar region (L1-S1) and radiology reports of these images were obtained for all patients. An orthopedist and a radiologist who participated in the study re-evaluated the lumbar zone 5 level intervertebral disc structure and neural foramina and classified all MRI results as those with no abnormality, those with nerve root compression, those with spinal canal stenosis and those with disc degeneration and bulging.

Degenerative disc disease diagnosis was made according to modified Pfirrmann criteria in T2 weighted section in midsagittal plane (Table-2) (13). Patients with Grade 2 - 6 disc degeneration change were deemed to have degeneration. Grade 7,8 disc degeneration was not observed in the patient group included in the study so it could not be evaluated.

Bulging diagnosis was made according to MRI assessments, Glenn et al.'s classification (Table-3) (14). Grade 1-3 was deemed as the presence of bulging symptom and included in the study.

Spinal canal stenosis or nerve root compression is caused by the central canal, lateral recess, or foramen. Diameter of normal lumbar spinal canal is 15-27 mm.

An anteroposterior area of the canal less than 70 mm² indicates central spinal stenosis. In our study, those with a central canal diameter less than 11.5 mm were regarded as spinal canal stenosis. Normal foraminal height is 20-23 mm at lumbar region. In our study, a foraminal height of 15 mm or less was associated with foraminal stenosis.

Statistical analysis

Descriptive statistics were used to define continuous variables. (mean, standard deviation, minimum, median, maximum)

Student's t test was used to compare two continuous independent and normally distributed variables, and Mann Whitney u test was used to compare two independent variables not showing normal distribution for age comparison by pathologies.

Chi-Square (or Fisher Exact test where applicable) was used to examine the relationship between categorical variables for statistical evaluation among the pathologic findings according to sex.

Statistical significance level was set to 0.05. Analyses were performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2013).

Results

Lumbar MRI results of 78 asymptomatic patients who received medical treatment due to low back pain that age and gender distribution at Table 4 and Table 5.

There was no abnormality in the MRI results of 16 patients (20%) examined within the study criteria. Nerve root compression was detected in 17 patients (22%), spinal stenosis in 24 patients (30%) and disc degeneration or bulging in 57 patients (78%). ($p > 0.05$). Table 6.

Age distribution by disk degeneration was 32,6+5,8/35 (20-40) ($p < 0,05$). Age distribution by Spinal stenosis was 31,5+6,5/31 (21-40), Herniated Nucleus 32,6+5,8/35 (20-40) and Bulging 32,1+6,1/32,5(21-41) ($P > 0,05$) (Table 7).

In addition to this, there was flattening due to lumbar lordosis loss in 27(%34) patients, osteophyte in 13(%16) patients, hemangioma in 7(%1) patients, simple cyst forming bone islet in 2(%0,2) patients and enchondroma in 1 (%0,1) patient.

Table 1: Asymptomatic patient assesment scheme.**Anamnesis and Physical Examination****Inspection**

- Lomber Lordoz
- Dorsal spine muscle weakness
- Posture

Palpation

- Spinous bulge
- Individual range
- Tenderness
- Mass

Joint movement range

- Extention
- Lateral flexion
- Rotation

Lower extremity examination

- Hip, Knee Ankle

Neurological view

- L4, L5, S1 neurological level test
- Patella reflex

Spesific Tests

- Straight leg lift test
- Femorat nerve stretch test

Table 2. T2 weighted section in midsagittal plane according to modified Pfirrmann criteria

Grade 1	Normal disc no disc degeneration
Grade 2,3	There is a signal change in disc nucleus and annulus fibers
Grade 4	The border between inner and outer fibers of annulus is indistinct in posterior edge
Grade 5	Disc is hypointense and there is no loss of disc height
Grade 6,7	Disc height loss progressive decrease
Grade 8	Final stage disc structure is completely distorted and disc height has disappeared

Table 3. T2 weighted section in midsagittal plane according to Glenn et al.'s classification

Grade 1	Mild bulging symptom, bulging from the edge is minimal
Grade 2	Mild bulging symptom
Grade 3	Intermediate protrusion
Grade 4	Protrusion
Grade 5	Herniation

Table 4. Distribution of patients by gender

Gender	N	%
Male	46	59.0
Female	32	41.0
Total	78	100.0

Table 5. Mean age range.

	N	Mean	Median	St. Deviation	Min.	Max.
Age	78	31.2	30.5	6.1	20	41

Table 6. Gender distribution of asymptomatic patient findings with *Fisher's Exact p* analysis.

		Male N (%)	Female N (%)	p
Herniated Nucleus	No	34 (73.9)	27 (84.4)	0.404
	Yes	12 (26.1)	5 (15.6)	
Spinal stenosis	No	35 (76.1)	19 (59.4)	0.139
	Yes	11 (23.9)	13 (40.6)	
Disc Degeneration	No	30 (65.2)	17 (53.1)	0.349
	Yes	16 (34.8)	15 (46.9)	
Bulging	No	18 (39.1)	8 (25.0)	0.229
	Yes	28 (60.9)	24 (75.0)	

Table 7. Age distribution of asymptomatic patient findings with *Mann-Whitney U p* analysis.

		Age Mean±Std. Deviation Med. (Min.-Max.)	P
Herniated Nucleus	No	30.8±6.2 30 (21-41)	0.332
	Yes	32.6±5.8 35 (20-40)	
Spinal Stenosis	No	31.07±6.03 30 (20-41)	0.765
	Yes	31.5±6.5 31 (21-40)	
Disc Degeneration	No	29.7±5.6 29 (21-40)	0.016
	Yes	33.4±6.4 36 (20-41)	
Bulging	No	29.3±5.8 29 (20-40)	0.053
	Yes	32.1±6.1 32.5 (21-41)	

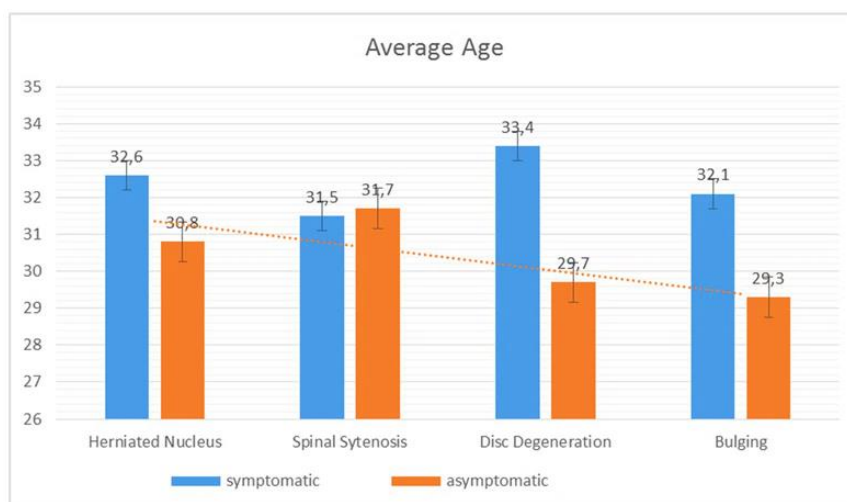


Figure 1: Asymptomatic patient findings distribution with age.

Discussion

Chronic back pain is a disease that involves a wide range of pathologies depending on the anatomical structures from which the pain originates, the severity of the pain, and whether it is of mechanical or inflammatory character. Main causes include lumbar muscle spasm, lumbar degeneration, disc herniation, and lumbar canal pathologies. In clinical examination and imaging assessments, 85% of patients do not have a specific diagnostic outcome or pathology and are considered as nonspecific low back pain (2,15,16). In our study, only 20% of the patients who had normal examination findings on the physical examination had completely normal MRI findings. Although the distribution of patients with normal MRI findings was found to be higher in the age range of 20-30 years, gender did not result in a significant difference. Powell et al. reported a linear increase in disc degeneration with age in a series of 302 cases in which the rate of intervertebral disc degeneration was assessed by MRI in asymptomatic women between the ages of 16-80 years, and more than one third of the patients with disc degeneration were in the range of 21-40 years of age (17). Disc degeneration and bulging were the most common findings in our study with a percentage of 78%. Disc degeneration and bulging are associated with inflammation, dehydration of nucleus pulposus, reduced disc height, annular tears, disc protrusion and deterioration of mechanical function as a result of deterioration of normal anatomy and biochemistry of disc upon changes emerging over time and the onset of degenerative process. Disc degeneration starts with aging and is the most prominent between 25 and 35 years of age. There is some disc degeneration in everybody after fifty years of age, and it mostly concerns L5-S1 and L4-L5 ranges (18,19). Our study showed that disc degeneration caused a statistical difference in age distribution. The distribution of findings by age groups is given in and bulging disc finding was more common in lower age range compared to other findings, whereas degenerative disc disorder was observed to be minimum. Figure 1. Nerve root compression, spinal canal stenosis were identified in all age ranges included in the study. All cases with disk degeneration had several grades of bulging symptoms, with the minimum being grade 1. These changes are known to lead to periodic pain attacks in the active age group with high labor force, resulting in labor loss. In patients with intact peripheral disc structure and no evidence of nerve root compression, chronic low back pain may arise from disruption of internal architecture of disc.(20) Possible mechanism related to degenerative disc involves growth of nociceptive nerve into intervertebral disc upon degeneration, causing pain by stimulation of these nerve endings by inflammatory mediators. Decreased disc height due to biomechanical changes upon degeneration manifests itself with annular bulging,

herniation and early osteophyte formation. Cartilage thinning associated with degenerative disc, capsule looseness, instability and increased range of motion increase osteophyte formation (15,19,21). These MRI changes not causing pathology indicate that the degenerative process proceeds from all directions. In our study, there was no patient showing grade 7,8 disc degeneration according to Pfirrmann classification. The reason for this gives us an idea about the detection of examination finding in these patients. Degeneration grades in the study group were similar in most patients, which was ascribed to the fact that the age range was similar so no assessment was made in that respect.

Central spinal stenosis is usually associated with facet joint hypertrophy and ligamentum flavum hypertrophy at the disc level. It is a degenerative process developing slowly in the lumbar region so the onset of complaints is generally insidious and slow. Neurogenic symptoms, which are conventional findings of spinal stenosis, are particularly manifested by pain, numbness and tingling in the lower extremities, particularly in calf. A canal diameter in the range of 10-13 mm is considered as relative spinal stenosis and a canal diameter less than 10 mm as significant spinal stenosis. In our study, the patients with measurements less than 11.5mm and thus spinal stenosis and grade 5 disc herniation did not cause any difference by age and gender. It has been reported that complaints related to disc herniation may decrease over time and that even MRI findings showing extruded disc herniation can completely resolve and pain-causing symptoms completely resolve. In a study of 3 subjects conducted by Kara et al., patients with severe clinical examination findings and extruded disc herniation, to whom surgical treatment was recommended, rejected surgical treatment and during their follow-ups, their complaints completely resolved and their MRI findings completely disappeared (22). In our study, 21% of patients without any clinical complaints had disc herniation findings. In a study investigating abnormal MRI findings in 102 normal healthy Korean subjects conducted by Sang et al., 36% of subjects had annular fissure, 38% nucleus degeneration, 11.9% disc protrusion, and 7% extruded disc, and it was suggested that lifestyle and cultural habits may be effective in percentages of these abnormal MRI findings being different from those obtained for other populations (10). MRI specificity in lumbar disc hernia ranges from 76% to 96%. In healthy individuals with no low back problem, abnormal MRI findings have reached values higher than 20%. Although an MRI scan provides detailed non-invasive anatomical images to the clinician, it is difficult to make a specific diagnosis in the majority of patients with low back pain (17,20). We believe that the evaluation of these data with physical examination will further increase diagnostic

specificity and that the specific findings obtained by MRI and their reflection on the patient with physical examination may be investigated in another study.

Conclusion

In magnetic resonance imaging performed due to low back pain, pathological changes in lumbar vertebrae are interwoven with physiological process, and it should be taken into account that the findings obtained by the clinician during assessment can also be seen in asymptomatic individuals.

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Ethical issues: All Authors declare that Originality of research/article etc... and ethical approval of research, and responsibilities of research against local ethics commission are under the Authors responsibilities. The study was conducted due to defined rules by the Local Ethics Commission guidelines and audits.

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