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The Impact of Occupational Features on Radiological Staging of the Lumbar Disc Herniation.

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ABSTRACT

Background: Lumbar disc herniation may cause back and/or leg pain, sensory deficits, loss of strength, and even urinary and fecal incontinence. The relationship between lumbar disc herniation (LDH) and occupation was tried to be revealed through various studies. In this study, the association between the radiological stage of LDH on magnetic resonance imaging (MRI) and occupational features of the patients was evaluated.

Materials and methods: Sociodemographic and occupational features were collected from medical files of 895 patients with lumbar disc hernia. The occupational groups consisted of housewives, construction workers, health care workers and teachers. Patients were divided into three groups according to the years spent at work as follows: 0-5 years, 5-10 years, 10-15 years and over 15 years. On MRI, LDH was classified as bulging, protrusion, extrusion and sequestration according to Macnab classification.

Results: There was no statistically significant relationship between the radiological staging of LDH and occupation (p=0.2) or gender (p=0.4). Increased(advanced) age and more working years had a significant association with the radiological staging of LDH (p <0.001).

Conclusion: There is a significant relationship between the progression of the radiological staging of LDH and the increased(advanced) age and working years.

Keywords: Lumbar disc herniation, magnetic resonance imaging, occupation

LOMBER DİSK HERNİSİNİN RADYOLOJİK EVRELEMESİ ÜZERİNE MESLEKSEL FAKTÖRLERİN ETKİSİ

ÖZET

Giriş: Lomber disk hernisi (LDH) bel ve/veya bacak ağrısına, duyu kusuruna, kuvvet kaybına ve hatta idrar ve gayta inkontinansına yol açabilmektedir. Çeşitli çalışmalarda LDH ve meslek arasındaki ilişki ortaya konmaya çalışılmıştır. Bu çalışmada, manyetik rezonans görüntülemede (MRG) LDH'ın radyolojik evresi ile mesleksel faktörler arasındaki ilişki araştırılmıştır.

Materyal metot: 895 hastanın sosyodemografik ve mesleksel faktörleri hastaların tıbbi dosyaları incelenerek toplanmıştır. Meslek grupları ev hanımı, inşaat işçisi, sağlık çalışanı ve öğretmenlerden oluşturuldu. Hastalar çalışma yılına göre 0-5, 5-10, 10-15 ve 15 yıl üzeri olarak gruplandırıldı. MRG'de lomber disk hernisi radyolojik evrelemesi Macnab sınıflamasına uygun olarak bulging, protrüzyon, ekstrüzyon ve sekestrasyon olarak gruplandırıldı.

Bulgular: Lomber disk hernisinin radyolojik evrelemesi ile meslek (p=0.2) ve cinsiyet (p=0.4) arasında istatiksel olarak anlamlı farklılık tespit edilmedi. Çalışma yılı ve yaşın artması ile lomber disk hernisinin radyolojik evrelemesi arasında anlamlı ilişki varlığı belirlendi (p <0.001).

Sonuç: Çalışma yılının ve yaşın artması ile lomber disk hernisinin radyolojik evresinin ilerlemesi arasında kuvvetli bir ilişki mevcuttur.

Anahtar sözcükler: Lomber disk hernisi, manyetik rezonans görüntüleme, meslek

LDH is a result of a degenerative spinal process comprising intervertebral disc degeneration and lumbar spondylosis, which may lead to back and/or leg pain, sensation disorders, loss of strength, and even urinary and fecal incontinence (1-3). However, LDH may also exist in asymptomatic individuals (4,5). In a previous study, researchers reported that LDH was diagnosed in 21% of healthy individuals aged 20-39 years, in 22% of healthy individuals aged 40-60 years, and in 36% of individuals aged over 60 (6).

Many possible predisposing factors for LDH were identified in numerous studies, such as genetic factors(inheritance), , age, gender, race, physical activity level, smoking, and body habitus (7-11). Diabetes mellitus, hyperlipidemia, and smoking have been reported to be potential risk factors for LDH (7). It was reported that surgical treatment for LDH and recurrent disc surgery are more frequent in patients with diabetes mellitus (12). Plasma triglycerides level and total cholesterol levelwere increased in patients with LDH and smoking is also an independent risk factor for LDH (13,14).

Moreover, the relationship between LDH and occupation was been studied through various studies (7,15). It has been reported that lumbar disc herniation was detected more frequently among patients who have heavy physical activities at work (16). However, in the literature, some studies couldn't find any important association between occupation and the degree of LDH (17). According to the terminology developed by the ''International Society for the Study of the Lumbar Spine" the radiological staging of the lumbar disc herniation is defined as bulging, protrusion, extrusion and sequestration, respectively (18). In the bulging stage, annulus fibrosis enlarges by exceeding its normal limit while the disc is solid. Focal dilatation of disc is seen due to the rupture of inner layers of annulus fibrosis if the posterior longitudinal ligament is solid in the protrusion stage. In the extrusion stage, all layers of annulus fibrosis are torn and extruded under the nucleus pulposus and posterior to the longitudinal ligament. In the stage of sequestration, extruded nucleus pulposus is freely observed in the channel by tearing the posterior longitudinal ligament (19). With increasing steps, the likelihood of the patient undergoing surgery increases (20).

In this study, we aimed to reveal the presence of any relationship between occupational features and the degree of LDH, which was staged by using magnetic resonance imaging (MRI).

Materials and methods

This study was approved by Bozok University Faculty of Medicine ethics committee for non-invasive clinical research (31.02.2017 dated, 26 numbered). The medical files of the patients who applied to the Neurosurgery Outpatient Clinic of Bozok University Hospital between December 2016 and January 2017 with lumbar disc degeneration according to radiological imaging (MRI) were collected. Patients' age, gender, additional comorbid diseases, occupation and working years were noted. The missing information was completed by calling the patients by phone. The age range for the study was maintained between 25 and 65 years old. According to the age, patients were categorized into three groups as follows: 25-35 years old, 35-45 years old, and over 45 years old. Patients were divided into groups according to their occupations which were housewives, the workers with heavy physical activity at work, teachers and health care professionals. Based on the working years, patients were divided into four groups as follows: 0-5 years (group 1), 5-10 years (group 2), 10-15 years (group 3) and over 15 years (group 4). Lumbar disc degeneration on MRI was staged as black**!?!?**(back) disc-bulging (group 1), protrusion (group 2), extrusion (group 3), and sequestration (group 4) according to ''International Society for the Study of the Lumbar Spine" classification (21).

Patients who still had missing data even after phone calls were excluded from the study. Patients who had a diagnosis of diabetes mellitus, chronic liver disease, hypertension, obesity, osteoporosis, ankylosing spondylitis, hyperlipidemia, and patients with severe trauma history were not included in the study. Patients under the age of 25 and over 65 were excluded from the study as well.

Statistics

The data obtained from the study were analyzed with the SPSS for Windows 22.0 program. In the presentation of the findings, frequency tables were used for qualitative data. The chi-square test was used to search the relationship between qualitative data variables. $\alpha = 0.05$ value was chosen as an error level in statistical evaluation. For p values, which are equal or smaller, values were interpreted as a significant difference.

Results

A total of 895 patients were included in the study. Demographic and radiological findings of the patients are presented in table 1. In the gender distribution, female domination (64.6%) was observed. Patients older than 45

Table 1. Distribution of demographic features of patients with lombar disc hernia

Age	*n*	%
25-35	155	17.3
35-45	326	36.4
>45	414	46.3
Sex		
Female	578	64.6
Male	317	35.4
Occupation		
Housewife	375	41.9
Teacher	142	15.9
Health care worker	168	18.8
Construction worker	210	23.5
Years in occupation		
0-5	163	18.2
5-10	212	23.7
10-15	325	36.3
>15	195	21.8
Degree of degeneration		
Bulging/Black disc	452	50.5
Protrusion	208	23.2
Extrusion	153	17.1
Sequestration	82	9.2

Table 2. Comparison of occupational demographics and degree of degeneration in patients with lombar disc hernia

	Degree of Degeneration			
	Bulging / Black disc	*Protrusion*	*Extrusion*	*Sequestration*
Sex				
Female (%)	66.6	63.9	58.8	65.9
Male (%)	33.4	36.1	41.2	34.1
p value			0.4	
Age				
25-35	20.1	7.7	20.3	20.7
35-45	35.0	35.1	43.1	35.4
>45	44.9	57.2	36.6	43.9
p value			<0.001	
Occupation				
Housewife	44.2	43.8	35.9	35.4
Teacher	15.5	14.9	13.1	25.6
Health care worker	17.5	18.3	23.5	18.3
Construction worker	22.8	23.1	27.5	20.7
p value			0.2	
Years in occupation				
0-5	21.2	20.7	12.4	6
5-10	24.6	26.4	17.6	23.2
10-15	35.6	37.5	37.3	35.5
>15	18.6	15.4	32.7	35.3
p value			<0,001	

years were dominant in the age group distribution with 46.3%, followed by patients in the age range 35-45 with 36.4%. In the occupational distribution of the patients with LDH, 41.9% were housewives, 23.5% were construction workers, 18.8% were health care workers and 15.9% were teachers. When the data are analyzed according to the years spent at work, the most frequently observed group is that one whose patients have worked for 10-15 years with 36.3%, followed by those who have a working life of 5-10 years with 23.7%. In the radiological disease stage, the most frequent one was bulging with 50.5%, followed by protrusion with 23.2%, extrusion with 17.1% and sequestration with 9.2%, respectively.

The relationship between radiological staging and occupational and sociodemographic variables was examined in patients with lumbar disc hernia (Table 2). There was no significant difference between radiological staging and sex (p=0.4). Bulging (44.9%), protrusion (57.2%), and sequestration (43.9%) were more common over 45 years old than other age groups, extrusion was higher at 35-45 age range with 43.1% (p<0.001). In 25-35 years group all radiological stages were the least seen (respectively, 35.6%, 37.5%, 37.3%, 35.5%) (p <0,001). There was no significant relationship between the occupational groups and radiological staging of the patients (p=0.2). All radiological stages were more frequent in patients who spent 10-15 years in working life than in other groups (respectively, 35.6%, 37.5%, 37.3%, 35.5%)(p <0,001). Bulging (18.6%) and protrusion (15.4%), which were the earlier phase in radiological staging, were least diagnosed with patients spent more than 15 years in working life (p <0,001). Extrusion (12.4%) and sequestration (6%), which were the advanced stages of the radiological diagnose, were the least seen in patients having a work-life less than 5 years (p <0.001).

Discussion

A number of predisposing factors such as gender, race, physical activity level, smoking and genetic factors were identified in previous epidemiologic studies (7-11, 22,23). In our study, demographic characteristics affecting

radiologic lumbar disc diagnosis were examined. Women constitute more than half of our patients and this information is consistent with the gender distribution seen in the literature. When examined in the age group, the incidence of the disease over the age of 45 (46.3%) was increased in accordance with the accumulative degenerative nature of the disease. Cummins et al. conducted a definitive study among patients with lumbar disc herniation, and the average age of participants was 41. In the same study, authors reported female predominance in patients with lumbar disc herniation (24).

In our study, different occupational groups such as housewives, construction workers, health workers and teachers were evaluated. The most common occupation group was housewives (41.9%) followed by construction workers (23.5%), health workers (18.8%) and teachers (15.9%) respectively. The relationship between LDH and the occupation was evaluated in various studies. LDH was diagnosed more frequently in foundry workers, agricultural workers, mariners, bricklayers, carpet manufacturers, road workers, miners, stone quarry workers, ironworkers, carpenters, dockers, transport workers, construction workers, and nurses those working more than 10 years (16, 25,26).

In our study, neither the sex ($p = 0.4$) nor the occupational group ($p = 0.2$) had an association with the radiological stage of the disease. In the literature, some studies also couldn't find any association between occupation and the degree of lumbar disc herniation (17). In concordance with the degenerative cumulative nature of the lumbar disc herniation bulging (44.9%), protrusion (57.2%) and sequestration (43.9%) were more common over 45 years old, whileall radiological stages were least seen at youngest age group ($p<0.001$). Furthermore, in terms of working years, which is another component of the accumulation disorder, bulging and protrusion were less observed in patients who had worked more than 15 years, whereas in the patients who worked less than 5 years, extrusion and sequestration were less observed ($p<0.001$).

Seidler et al. evaluated the possible etiological association between physical and psychosocial workload with LDH in cases with or without osteoporosis or spondylosis. In the study, a significant relationship was not found between excessive flexion and LDH lumbar disc herniation whether having osteochondrosis or spondylosis diagnoses or not. In addition, a statistically significant relationship between LDH and cumulative exposure to weight lifting or bearing in the presence of accompanying osteochondrosis or spondylosis was found (15). In another study, a positive correlation between a cumulative occupational lumbar load in both genders and lumbar disc herniation was revealed (27).

The strong aspects of our study are the multiplicity of patients and the diversity of the patient groups. The other strength is the limited numbers of studies conducted in Turkey about occupational features of LDH. However, we didn't aim to reveal any causal relationship between occupation and LDH.

In conclusion, a significant correlation is present between the progression of the radiological staging and increased (advanced) age and years spent at work. However, there is no relationship between the occupational groups and radiological staging.

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