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Araştırma / *Research Article*

Is There a Relationship Between Joint Hypermobility and Lumbar Disc Degeneration and Also Low Back Pain? A Multidisciplinary Clinical Study

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Eklem Hipermobilitesi ile Lomber Disk Dejenerasyonu ve Bel Ağrısı Arasında İlişki Var mı? Bir Multidisipliner Klinik Çalışma

ABSTRACT

Objective: *Hypermobility (HM) is a hereditary or acquired condition of connective tissue in which the synovial joints have range of movement beyond their normal limits and its effects on disc degeneration (DD) is not fully known. In our study, We aimed to reveal the relationship between joint hipermobility, lumbar DD and also low back pain.*
Method: *The cases aged between 20-50 years with low back and/or leg pain were included in the study. Their lumbar MRIs were evaluated using Pfirrmann grading system. For the cases meeting the study criteria, the Beighton score was used for evaluating the generalized joint laxity, and the 1998 Brighton criteria were used to assess the benign joint hypermobility syndrome. The cases were also evaluated prospectively for pain by using the visual analog scale (VAS) and for disability using the Oswestry disability index (ODİ).*
Results: *Hundred and seventy-two cases with a mean age of 36.82±7.62 years including 112 female (65.1%), and 60 male (34.9%) patients met the inclusion and the exclusion criteria, While 14 % of cases had joint HM, and HM was not encountered in 86% of them. There was no statistically significant difference in the values of Pfirrmann grade parameters at all lumbar disc levels between the groups with and without HM (p> 0.05). Likewise, there was no statistically significant difference between the groups concerning the VAS and the ODI values (p>0.05).*
Conclusion: *These findings suggest that HM may not be a risk factor for increased lumbar DD grades, VAS and ODI scores in patients aged between 20-50 years.*

Keywords: *low back pain, benign joint hypermobility syndrome, disc degeneration, hypermobility, generalized joint hypermobility, lumbar spine*

ÖZ

Amaç: *Hipermobilite (HM) sinovial eklemlerin normal sınırının ötesinde hareket yeteneğinin olduğu bağ dokusunun çoğunlukla kalıtsal ya da edinilmiş bir durumu olup lomber disk dejenerasyonu (DD) üzerine etkileri tam olarak bilinmemektedir. Çalışmamızda eklem hipermobilitesi ile lomber DD ve ayrıca bel ağrısı arasındaki ilişkinin araştırılması amaçlandı.*
Yöntem: *Bel ve/veya bacak ağrısı yakınması olan ve son altı ay içinde çekilmiş lomber MRİ'lerinde DD saptanılan 20-50 yaş arasındaki olgular çalışmaya dahil edildiler. DD değerlendirimi Pfirrmann derecelendirme sistemine göre yapıldı. Çalışma kriterlerine uyan tüm olgular Beighton skoru kullanılarak generalize eklem hipermobilitesi yönünden değerlendirilmiş, benign eklem hipermobilitesi sendromu değerlendiriminde ise, 1998 Brighton kriterleri kullanılmıştır. Ayrıca, olguların ağrı derecesi değerlendiriminde vizüel analog skala (VAS) kullanılmış, dizabilite değerlendirimi ise Oswestry dizabilite indeksi (ODİ) kullanılarak prospektif olarak yapılmıştır.*
Bulgular: *İçerleme ve dışlama kriterlerine uyan 172 olgunun 112'si kadın (%65,1), 60'ı erkek (%3.9), olguların yaşları ortalaması ise 36,82±7,62 yıl idi. Bu olguların 24'ünde hipermobilite varken (%14), 148'inde HM'ye rastlanılmadı (%86). HM görülenler ve görülmeyenler arasında tüm lomber disk düzeylerinde Pfirrmann grade parametreleri değerleri açısından istatistiksel olarak anlamlı bir farklılık bulunmadı (p>0.05). Aynı şekilde gruplar arasında VAS değerleri ve ODİ değerleri açısından da istatistiksel olarak anlamlı bir farklılık yoktu (p>0.05).*
Sonuç: *Bu sonuç 20-50 yaş aralığındaki olgularda, normal şartlar altında, HM'nin lomber DD'u ile VAS ve ODİ artışında bir risk faktörü olmayabileceğini düşündürmüştür.*

Anahtar kelimeler: *bel ağrısı, benign eklem hipermobilite sendromu, disk dejenerasyonu, hipermobilite, jeneralize eklem hipermobilitesi, lomber omurga*

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INTRODUCTION

Hypermobility (HM) is an observed phenomenon which can be inherited or rarely acquired and in which the synovial joints can have a range of motion (ROM) beyond the reasonable limits. Its prevalence varies by sex, age, and racial characteristics, but can reach 15% in adults and 30% in childhood [1]. HM is a serious condition since it is associated with chronic pain complaints, premature osteoarthrosis (OA), osteoporosis (OP), vascular and spinal disorders [2] and cannot be detected if it is not investigated [3]. Although in childhood and adolescence HM is referred to as generalized joint laxity (GJL) and since it is associated with the clinic in adults, it is referred to as benign joint hypermobility syndrome (BJHS), and different diagnostic criteria have been used [4]. While Beighton criteria [3,5] are used to detect GJL (Appendix 1), Brighton criteria are used for the diagnosis of BJHS (Appendix 2) [6]. The Brighton criteria differentiate BJHS from other connective tissue disorders and the rare causes of HM such as Ehlers-Danlos syndrome, Marfan's syndrome and osteogenesis imperfecta [3].

Appendix 1. Beighton hypermobility score*

	Right	Left
Dorsiflexion of the fifth metacarpal joint >90˚	1	1
Passive apposition of the thumb to the flexor aspect of the forearm	1	1
Passive hyperextension of the elbow >10˚	1	1
Passive hyperextension of the knee >10˚	1	
Palms of the hands resting flat on the floor with the patient standing erect with fully extended knees	9	
Total		

** Note: A threshold cutoff value of four in total nine points was used to classify generalized joint laxity.*

Low back pain (LBP) is one of the severe health problems and, lumbar disc degeneration (LDD) is one of tts most common causes [7]. Although many factors have been identified that aggravate disk degeneration (DD) [8] the effect of HM on DD and LBP is not fully understood. Currently, the MRI is the most valid noninvasive examination tool used to assess the lumbar spine morphologically and to detect the association of these morphological changes with LBP [9]. Pfirrmann grading (PG) system is comprehensive, with intra- and interobserver reliability sufficient to discriminate between the different grades [10].

We aimed to investigate the effect of HM on DD grades at all levels of the lumbar IVDs and also LBP, in the non-operated and the non-traumatized cases. As far as we know, this is the first study in English literature which is used the PG for this purpose.

MATERIAL and METHODS

TThis study was conducted with the approval of the ethics committee of Fatih Sultan Mehmet Training and Research Hospital (decision date, and number: 11.23.2017/112). The informed consent form was obtained from all patients included in the study. The cases with waist and leg pain, aged between 20-50 years, were evaluated prospectively. The effects of the HM on the lumbar IVDs in the MRI were compared with the case-control study. Patients with a history of lumbar surgery, tumor, rheumatic disease or infection, stroke, dementia or diseases requiring intensive care, and women in their menopausal period were not included in the study. During the

Appendix 2. Revised 1998 Brighton criteria.

Major criteria

- Beighton score of 4/9 or greater (either currently or historically)
- Arthralgia for longer than three months in 4 or more joints

Minor criteria

- Beighton score of 1, 2, or 3/9 (0, 1, 2, or 3/9 if aged >50 years)
- Arthralgia in one to three joints or back pain for more than three months, spondylolysis, spondylolysis/spondylolisthesis
- Dislocation/subluxation in more than one joint or one joint on more than one occasion
- Soft tissue rheumatism with >3 lesions (e.g., bursitis, tenosynovitis, epicondylitis)
- Marfanoid habitus (tall, slim, span/height ratio >1.03, upper/lower segment ratio <0.89, arachnodactyly (positive Steinberg/wrist signs)
- Cutaneous lesions: striae, hyperextensibility, thin skin
- Eye signs: Drooping eyelids, myopia, or antimongoloid slant
- Varicose veins or a hernia or uterine/rectal prolapse

Required diagnostic criteria for hypermobility: Two major criteria or, one major and two minor criteria or, four minor criteria or, the presence of BJHS in first-degree relatives and two minor criteria.

Table 1. Evaluation of demographic data according to the presence of hypermobility.

		Hypermobility		p
		Present n (%)	Absent n (%)	
Age (year)	20-30	8 (33)	29 (20)	[1]0,241
	31-40	10 (42)	62 (42)	
	41-50	6 (25)	57 (38)	
Gender	Male	5 (21)	55 (37)	[2]0,185
	Female	19 (79)	93 (63)	
Job	Working	10 (42)	84 (57)	[2]0,247
	Not Working	14 (58)	64 (43)	
Body Mass Index	≤25	11 (46)	51 (35)	[2]0,397
	>25	13 (54)	97 (65)	
Fingertip-to-Floor	Touching	12 (50)	98 (66)	[2]0,192
	Not Touching	12 (50)	50 (34)	
Waist Circumference (cm)	Male			
	≤102	5 (100)	38 (69)	[3]0,309
	>102	0 (0)	17 (31)	
	Female			
	≤88	8 (42)	31 (33)	[2]0,640
	>88	11 (58)	62 (67)	
Smoking	<5	17 (71)	90 (61)	[2]0,500
	≥5	7 (29)	57 (39)	
Previous Illness	Preseent	12 (50)	62 (42)	[2]0,602
	Absent	12 (50)	86 (58)	
Consanguineous Marriage	Present	19 (79)	117 (79)	[2]1,000
	Absent	5 (21)	31 (21)	

[1] *Chi-square Test*
[2] *Continuity (Yates) Correction*
[3] *Fisher's Exact Test*

study period between December 2017 and May 2018, 172 of 2088 patients complied with our criteria. The patients filled the questionnaires, and their demographic data, waist circumference values, and fingertip-to-floor (FTF) distances were recorded, body mass indexes (BMIs) were calculated, and lumbar MRIs obtained within the last six months were evaluated. The evaluation HM was made using the Beighton score (Appendix 1), and the revised Brighton (Brighton 1998) criteria (Appendix 2) [5,6]. A cut-off value of four in a total of nine points was used to classify GJL. A 1: 6 equivalence design was used to compare the cases with (Group A) and without hypermobile (Group B) joints. The severity of pain was assessed using the visual analog scale (VAS) [11], and the clinical outcome using the Oswestry Disability Index (ODİ) [12]. The MRİs were evaluated blindly and all lumbar IVD levels, and the severity of DD was classified using the PG system. In this grading system, evaluation of DD degree is made at five grades (G I-V) considering the disk density and height [10]. While grade I corresponds to healthy intervertebral disc (homogenous bright white structure), grades II and III to mild, grade IV to moderate and, grade V to severe degeneration of IVD, accordingly. A point was given for every grade in a direct proportion to the grade (1 point to grade 1 degeneration, 5 points to grade 5 degeneration), the mean± standard deviations of these five grades were calculated and the values were compared between the two groups.

For statistical analysis, data were evaluated using the SPSS for Windows version 22.0 software (IBM Corp., Armonk, NY, USA) program. Descriptive statistical methods (mean, standard deviation, frequency) were used for the evaluation of data. Chi-square

Table 2. Evaluation of visual analog scale, Oswestry disability index parameters and Brighton Criteria according to the presence of hypermobility.

		Hypermobility		
		Present n (%)	Absent n (%)	p
Visual Analog Scale	≤5	14 (58)	80 (54)	[1]0,865
	>5	10 (42)	68 (46)	
Oswestry Disability Index	≤30	1 (4)	12 (8)	[2]0,474
	31-50	12 (50)	51 (35)	
	51-75	9 (38)	58 (39)	
	76-100	2 (8)	27 (18)	
Brighton Criteria	Absent	7 (29)	102 (69)	[1]0,000*
	Present	17 (71)	46 (31)	

[1] Continuity (Yates) Correction
[2] Fisher Freeman Halton Test
**p<0.05*

test, Fisher's Exact test, Fisher Freeman Halton test and Yates continuity correction test were used for the comparison of qualitative data. A p value of <0.05 was accepted as statistically significant.

RESULTS

Of the 172 cases that met the inclusion and exclusion criteria, 60 cases (34.9%) were male and 112 cases (645.1%) were female, and the mean age was 36.82± 7.62 years. HM was detected in 24 (13.8%), and was not detected in 148 (86.2 %) cases There was no difference between these groups regarding age, gender, smoking status, previous illnesses, WC, BMI, FTF distance, and presence of consanguineous marriage (p>0.05) (Table 1). Also, there was no statistically significant intergroup difference as for VAS scores and ODI values (Table 2).

DISCUSSION

At present, MRI is the best noninvasive examination tool is used to evaluate lumbar vertebrae [9]. It has been reported that reduced signal intensity is related to dehydration and decreased proteoglycan content, but the latter issue continues to be the subject of debate [13]. Pfirrmann et al. used both signal intensity and disc height categories in their classification and, showed that the low signal intensity in the MRİ is mostly associated with dehydration [10].

All functional spinal unit elements, such as IVDs, facet joints, bony structures, and spinal ligaments may undergo degenerative changes, but mainly IVDs are responsible for the instability [14,15]. In autopsies of the patients under 50 years of age, 85-95% of these cases were reported to have LDD, suggesting that the DD may also occur other than the age factor such as mechanical or metabolic injury [7,8].

It has been claimed that the deteriorated proprioception in the hypermobile cases increases the susceptibility to sports injuries and the traumatized joints lead to more serious problems [3,16,17]. Some of the vertebral joints lie between relatively fixed and movable regions. While the movement in one region increases as a result of HM which may rapidly lead to faster and more severe degeneration of the joint which lies between the relatively less mobile and the hypermobile parts. Likewise, this situation is seen both in the presence of lumbosacral transitional vertebra and in the adjacent segment disease (ASD), which is a complication of the lumbar stabilization [18]. It has been reported that restriction of movement with rigid posterior lumbar interbody fusion in the cases with HM leads to overload in the adjacent segment, and in these cases, ASD is seen more frequently than the others [19]. Therefore, before the spinal surgery, patients should be assessed regarding HM and rigid stabilization should be avoided in these cases.

Although HM is not commonly referred to as a disease, the predominant complaint is usually widespread and long-lasting pain, and it is also the most

common cause of unexplained joint pain [3]. But, the relationship between increased lumbar segmental motion and LDD and also LBP is still controversial [20-23]. Our results suggest that HM does not lead to increase in DD, VAS, and ODI values (Table 2) which can be an indicator of the importance of maintaining the joint motion harmonization especially for the cases who have hypermobile joints. Since the evaluation of HM is difficult in the elderly, we included the men under 50 years old and premenopausal women in our study. Also, we selected the cases having the same demographic characteristics such as nonobese individuals without history of trauma (Table 1). Our study results also suggest that hypermobile cases should be informed about to start lumbar paravertebral muscle strengthening exercises at an earlier age and, avoid both obesity and any trauma.

One of the limitations of our study is that radiological evaluations are made only on IVDs. To elucidate the relationship between HM and LBP, radiological evaluations should also be performed on facet joints and posterior ligamentous complexes. Other limitations are limited number of hypermobile cases and the large age range. Studies performed on greater number of cases in every decade can give healthier results.

Ethics Committee Approval: Approval of the Clinical Research Ethics Committee of SBU Istanbul Fatih Sultan Mehmet Training and Research Hospital was obtained (decision number: 23.11.2017 / 112).
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