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Work Characteristics and Axial Spondyloarthritis: Evaluation from a Broad Perspective with Clinical, Laboratory, Radiography and Ultrasonography

Çalışma Koşulları ve Aksiyel Spondiloartrit: Klinik, Laboratuvar, Radyoloji ve Ultrasonografi Yöntemleri ile Geniş Bir Perspektiften Değerlendirilmesi

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Abstract

Objectives: The aim of this study is to investigate the effect of work conditions that require physical performance on axial spondyloarthritis with clinical, laboratory and radiological measurements. In addition, the performance of ultrasonographic examination in showing the effect of work characteristics on enthesopathy was evaluated.

Materials and Methods: The present study is a single-center cross-sectional analysis conducted on 51 axial spondyloarthritis (axSpA) patients who were diagnosed according to the Assessment of Spondyloarthritis International Society criteria between October 2020 and December 2020 (24 females, 27 males, mean age: 46.98±9.30 years, 15 ankylosing spondylitis patients, 36 nr-axSpA). Demographic and clinical characteristics, along with disease related laboratory data of the patients, were recorded.

Results: Work duration was found to be positively correlated with Maastricht ankylosing spondylitis enthesitis score (MASES), foot deformity, and erythrocyte sedimentation rate (ESR), while negatively correlated with thoracal Schober. Physical activity level at work was positively correlated with the Bath ankylosing spondylitis metrology index, Bath ankylosing spondylitis disease activity index, ankylosing spondylitis disease activity score-ESR, MASES, foot deformity and ESR, while it was negatively correlated with thoracal Schober. Leisure activity level was only positively correlated with foot deformity. In the findings in radiological parameters, it was measured that the work duration was positively correlated with the thickness of the distal patellar and Achilles tendon. The level of physical activity at work positively correlates with distal patellar tendon thickness, Achilles tendon thickness, and plantar fascia thickness. It was seen that the activity level in leisure time was only positively correlated with distal patellar tendon thickness.

Conclusion: Physical activity level at work in axSpA patients is related to the severity of disease activity and decreased spinal mobility. In particular, increase of mechanical workload causes acute inflammation at the lower extremity and all enthesopathy points, independently from radiological progression and disease activity. The addition of ultrasonographical examination may supply a better evaluation of the effects of physical activity level at work on patients.

Key Words: Axial Spondyloarthritis, Physical Activity, Enthesopathy, Ultrasonography

Öz

Amaç: Bu çalışmanın amacı, fiziksel performans gerektiren iş koşullarının aksiyel spondiloartrite etkisini klinik, laboratuvar ve radyolojik ölçümler ile araştırmaktır. Ayrıca, ultrasonografik incelemenin iş karakteristiğinin entesopatiye etkisini göstermedeki performansı değerlendirilmiştir.

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Gereç ve Yöntem: Bu çalışma, tek merkezli kesitsel bir analiz olarak yürütüldü. Ekim 2020-Aralık 2020 tarihleri arasında, Uluslararası Spondiloartrit Değerlendirme Derneği kriterlerine göre tanı konulan, 51 aksiyal spondiloartrit (axSpA) hastası (24 kadın, 27 erkek, ortalama yaş: 46,98±9,30 yıl, 15 ankilozan spondilit hastası, 36 nr-axSpA) çalışmaya alındı. Hastaların demografik ve klinik özellikleri, hastalıkla ilgili laboratuvar, radyolojik ve ultrasonografi ölçümleri kaydedildi.

Bulgular: İşteki çalışma süresi Maastricht ankylosing spondylitis enthesitis score (MASES), ayak deformitesi ve eritrosit sedimantasyon hızı (ESR) pozitif korelasyon içinde iken torakal Schober ile negatif korelasyonludur. İşteki fiziksel aktivite seviyesi ise Bath ankilozan spondilit metroloji indeksi, Bath ankilozan spondilit hastalık aktivite indeksi, ankilozan spondilit hastalık aktivite skoru-ESR, MASES, ayak deformitesi ve ESR ile pozitif olarak korelasyon içinde iken yine torakal Schober ile negatif korelasyonlu bulunmuştur. Boş zamandaki aktivite seviyesi ise yalnızca ayak deformitesi ile pozitif korelasyonludur. Radyolojik parametrelerdeki bulgularda ise işteki çalışma süresinin, distal patellar ve aşil tendon kalınlığı ile pozitif korele olduğu ölçülmüştür. İşteki fiziksel aktivite seviyesi, distal patellar tendon kalınlığı, aşil tendon kalınlığı ve plantar fasya kalınlığı ile pozitif koreledir. Boş zamandaki aktivite seviyesinin ise yalnızca distal patellar tendon kalınlığı ile pozitif korele olduğu görülmüştür.

Sonuç: AxSpA hastalarının işyerindeki fiziksel aktivite seviyesi, hastalık aktivitesinin şiddeti ve spinal hareketliliğin azalması ile ilgilidir. Özellikle mekanik iş yükünün artması, alt ekstremitede ve tüm entezopati noktalarında, radyolojik progresyon ve hastalık aktivitesinden bağımsız olarak akut enflamasyona neden olur. Ultrasonografik ölçüm, iş yerinde fiziksel aktivite düzeyinin hastalar üzerindeki etkilerinin daha iyi değerlendirilmesini sağlayabilir.

Anahtar Kelimeler: Aksiyel Spondiloartrit, Fiziksel Aktivite, Entezopati, Ultrasonografi

Introduction

Spondyloarthropathies (SpA) are a group of chronic inflammatory and systemic rheumatologic diseases which include ankylosing spondylitis (AS), psoriatic arthritis, reactive arthritis, and enteropathic arthropathy (1). AS is a form of SpA affecting the spinal vertebrae, sacroiliac (SI), and/or peripheral joints. The prevalence of adult AS varies with gender and geographical region and is generally between 0.2% and 1.61% (2).

Axial spondyloarthritis (axSpA) is an inflammatory arthritis that primarily affects the spine, the SI joints, and surrounding soft tissues such as tendons and ligaments. AxSpA causes pain and stiffness in the back, lower back, hips, and buttocks. AxSpA may cause ankylose and spinal deformities at later stages of the disease. Arthritis, dactylitis, and enthesitis may be observed in peripheral joints. Symptoms and deformities related to SpA generally cause serious functional disabilities (3). The young population is more affected by this disease, resulting in loss of labor productivity and socio-economic problems (4-11).

Studies show that SpAs result in a 10-50% decrease in working hours and cause work disabilities, which vary by the age of patients, stage of the disease, and health systems of countries (4-11). Almost half of axSpA patients have such disabilities, giving rise to an important economic burden (4). Therefore, studies investigated key factors related to work disability and it was found that high disease activity, poor physical functionality, and reduced spinal mobility positively correlate with work disability (5,6,10-12). In contrast with the mentioned studies, the present study focuses on effect of job characteristics on the patient.

This study aims to evaluate the relationship between job characteristics that require different physical performance and clinical, laboratory and radiological features of axSpA disease from a broad perspective. In this context, the effects of working time, physical activity at work and in leisure time on AxSpA disease were investigated. These effects were assessed by measuring disease activity, functional status, radiological progression, and enthesitis status of AxSpA patients. The performance of ultrasonography in showing the effects of workload in AxSpA patients was also studied.

Materials and Methods

The present study is a single-center cross-sectional analysis conducted on 58 axSpA patients who were diagnosed according to the Assessment of Spondyloarthritis International Society criteria between October 2020 and December 2020 and were later followed up (13).

Seven patients were excluded from the study because they could not complete the radiological imaging methods. A number of patients could not attend because they did not have time for ultrasound examination. Another group of patients did not want to have an X-ray. The study was completed with 51 patients. Of 51 axSpA patients, 15 were AS and the remaining 36 were non-radiographic-axSpA (nr-axSpA).

Inclusion criteria were:

- Being over 18 years of age
- Being ambulatory with/without assistive device (not bedridden or on wheelchair)
- Having a paid/unpaid job with for at least one year.

Exclusion criteria were:

- Having another inflammatory rheumatic disease
- Having peripheral SpA and SpA related to psoriasis, inflammatory bowel, Familial Mediterranean Fever and

Behçet's disease

- Having progressive or non-progressive neurological diseases (multiple sclerosis, Parkinson's disease, cerebrovascular disease etc.)
- Having a history of trauma or surgery in spine and lower extremity
- Having a known mood disorder and psychiatric illness
- Being pregnant or breastfeeding women
- Having changed jobs or a break more than 30 days within one year.

Before the evaluation, patients were given verbal and written information on the nature of the study. Informed consent forms were signed upon admission to the trial. All procedures were conducted according to the relevant principles of the Helsinki Declaration. Moreover, approval of the study was obtained from University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Clinical Research Ethic Committee (approval no: 98/03, date: 19.10.2020).

Demographic Characteristics

Demographic characteristics of the patients: gender, education duration, body mass index, and presence of added comorbidity were recorded.

Nord-Trøndelag Health Study Physical Activity Level for Work (HUNT 2) questionnaire was administered to assess physical activity level at work, (i.e., workload) (14). According to this scale, patients were grouped by their work status and physical activity level. The categories were defined in four levels:

- Level 1: Sedentary work
- Level 2: Work involving walking but no heavy lifting
- Level 3: Work involving both walking and heavy lifting
- Level 4: Particularly strenuous physical work

Leisure time physical activity is divided into three levels as:

- Level 1: no physical activity or light activity
- Level 2: less than 2 hours of hard physical activity in leisure time per week
- Level 3: more than 3 hours of hard physical activity in leisure time per week.

Clinical Disease Characteristics

The duration of the disease was measured in years. Bath AS disease activity index (BASDAI) for disease activity (6 questions) (15,16) and Bath AS functional index were used to assess functional limitation (10 questions) (17,18) using the visual analogue scale with 0-10 cm. Also, Bath AS metrology index (BASMI) was measured to determine clinically significant changes in spinal mobility (19). The scores of the three scales were evaluated between 0-10. Low scores on all three scales showed good condition. The severity of axSpA was found using clinical (back pain, morning stiffness, patient global assessment, and peripheral pain/swelling) and laboratory data erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP). Maastricht AS enthesitis score (MASES), with a score between 0-13 was used to assess enthesitis status (20).

Physical examinations including thoracal Schober's test, foot deformity, New York Posture Rating (NYPR) (21), and Berg balance scales were performed to assess the patients' postural changes and balance (22). NYPR scale was used to evaluate the body segment illustrations with a score 0-100, including posterior views of the head, shoulders, spine, hips, feet, and lateral (left side) views of the neck, upper back, trunk, abdomen, and lower back, and a low score indicates poor posture. Berg balance scale is a 14-item objective measure that assesses static balance with a score between 0 and 56; a high score shows independence in balance. The quality of life for AS was measured with AS quality of life (ASQoL) questionnaire (23,24). It was used to assess the impact of the disease on AS patient's quality of life with 18 items measure.

Disease-related Laboratory Data

The acute phase reactants ESR and CRP, along with human leukocyte antigen (HLA)-B27 gene analysis values were recorded. ESR is the precipitation rate of erythrocytes per hour. Although it may change with many factors such as age and gender, its normal value is between 0-20 mm/hour and can reveal inflammatory activity. CRP nominal value is 0-5 mg/L and shows response to inflammation. ESR HLA-B27 is a blood test looking for a protein that is found on the surface of white blood cells and may predict the predisposition to axSpA.

Disease-related Radiologic Measurements

Disease-related radiological measurements were taken, including magnetic resonance imaging (MRI), X-ray radiography and ultrasonography methods. The presence of sacroiliitis was recorded using MRI. Two-directional cervical, lumbar vertebrae and feet radiographies were taken. Modified stoke AS spinal score (MSASSS) was calculated (25) and calcaneal inclination and Meary's angles were measured (26,27).

The MSASSS is a well-validated scoring method for quantifying chronic structural changes on conventional radiographs. The total MSASSS is calculated by analyzing the 24 vertebral edges including the lumbar and cervical vertebrae, based on lateral radiographic views of the vertebrae from 0 to 3: where 0= no abnormality; 1= erosion and/or sclerosis and/or squaring; 2= syndesmophyte (non-bridging) and 3= total bony bridging between upper and lower vertebral edges (ankylosis). The reference range is 0-72. High scores show increased radiological progression. Calcaneal inclination and Meary's

angles were measured on dominant extremity according to the literature where low angle (<18°) indicates pes planus and high angle (≥30°) indicates pes cavus (26,27). The calcaneal inclination angle was used to classify the severity of deformity according to the Meary's angle as: mild (<15°), moderate: (15-30°) and severe: >(30°).

Ultrasonographic (US) examinations were performed by an experienced PMR specialist using a 7-12 MHz linear array transducer (Logiq P5, GE, Korea). Patients were laid in a supine position with knees flexed 60° to make the quadriceps tendon insertion, the superior patellar tendon insertion, and the inferior patellar tendon insertion at the anterior tibial tuberosity visible. Afterwards, patients were laid in prone position with ankles at neutral flexion to evaluate the insertions of the Achilles tendon and the plantar aponeurosis at the calcaneus. All areas were scanned bilaterally. Sonographic entheseal index (SEI) of the lower limbs was calculated for entheseal injury (range: 0-76 points) (28) and the Glasgow Ultrasound Enthesitis Scoring System (GUESS) (29) was used to assess degenerative changes such as tendon thickness, the existence of enthesitis, bursitis, or erosions (range: 0-36 points). Additionally, quadriceps, proximal/distal patellar tendon, Achilles and plantar fascia thickness measurements in SEI of dominant extremity were recorded.

Study Protocol

Clinical evaluations, scoring of radiological images and US examinations of the patients were performed by blinded experts to prevent bias. The work characteristics of the patients were correlated with the clinical, laboratory and radiological parameters associated with the disease.

Statistical Analysis

Data analysis was made using the Statistical Package for the Social Sciences (SPSS) 22.0 for Windows. The continuous variables were evaluated with the Kolmogorov-Smirnov test to decide whether they were different from a normal distribution.

Descriptive statistics were presented as mean ± standard deviation and median (minimum-maximum) for continuous variables, along with frequencies and percentages (%) for nominal and categorical variables. The Spearman's correlation (rho) was used for correlation analysis of categorical and continuous (with non-normal distribution) variables, along with Pearson's correlation test for continuous variables with normal distribution and dichotomous variables. A p-value of less than 0.05 was considered as statistically significant.

Results

The mean age of the patients included in the study was 46.98±9.30 years, 27 (52.9%) were male and 24 (47.1%) were female. The median work duration was 14.00 (0.0-40.0) years and a sizable part (n=19, 37.3%) had sedentary/mild-level work. Demographic and disease characteristics are presented in Tables 1 and 2. While the disease activity of patients (BASDAI) and ASQoL were moderate (3.57±2.10 and 7.88±5.00, respectively), disease activity according to the AS disease activity score (ASDAS)-ESR and ASDAS-CRP were high (2.39±0.80 and 2.58±0.82, respectively). The mean posture score assessed by NYPR scale showed moderate posture disorder (60.29±16.16).

Disease-related radiological measurements are shown in Table 3. The mean structural progression score MSASSS was 38.70±9.98, a moderate level. Thirty-one patients according to the calcaneal inclination angle and 32 patients according to the Meary's angle had foot deformity. The mean SEI and GUESS scores were determined by US to be 26.54±4.75 and 23.06±4.13, respectively.

Correlation results between work characteristics and evaluation parameters are presented Tables 4 and 5. It was found that work duration was in positive correlation with MASES (rho=0.287 p=0.007), foot deformity (rho=0.318 p=0.005) and ESR (rho=0.292 p=0.008) but in negative correlation with thoracal Schober distance (rho=-0.308 p=0.004). In addition, physical activity level at work was found to be positively

Table 1: Demographic characteristics of patients

	n=51
Age (years) mean ± SD	46.98±9.30
Gender n (%)	
Male	27 (52.9)
Female	24 (47.1)
Education duration (n%)	
Illiterate	15 (29.4)
5 years	8 (15.7)
8 years	15 (29.4)
11 years	11 (21.6)
>11 years	2 (3.9)
BMI (%) mean ± SD	27.80±4.01
Additional comorbidities (n%)	
Presence	19 (37.3)
Absence	32 (62.7)
Work duration (years) median (min.-max.)	14.00 (0.0-40.0)
Physical activity level for work (n%)	
Sedentary work	19 (37.3)
Work involving walking, but no heavy lifting	19 (37.3)
Work involving both walking and heavy lifting	11 (21.5)
Particularly strenuous	2 (3.9)
Physical activity level for leisure time (n%)	
No physical activity or light activity per week	13 (25.4)
≤2 hours hard physical activity per week	19 (37.3)
≥3 hours hard physical activity in leisure time per week.	19 (37.3)

SD: Standard deviation, BMI: Body mass index, min.-max.: Minimum-maximum

correlated with BASMI, BASDAI, ASDAS-ESR, MASES scores, ESR and foot deformity but again negatively correlated with thoracal Schober distance. We have found that increase of leisure time activity is related to the presence of foot deformity only.

Radiological examinations have shown that enthesitis scores (SEI and GUESS) and thickness of distal patellar tendons increased with work duration, leisure time and physical activity levels of work. Thickness of Achilles tendon has been found to positively correlate with work duration and physical activity level at work. In addition, physical activity level at work was in positive correlation to plantar fascia thickness and in negative correlation to calcaneal inclination angle.

Table 2: Disease-related clinical and laboratory parameters of patients

	n=51
Disease duration (years) median (min.-max.)	6.00 (2.00-47.00)
BASFI (0-10) median (min.-max.)	2.60 (0.0-8.20)
BASMI (0-10) mean ± SD	3.32±1.31
BASDAI (0-10) mean ± SD	3.57±2.10
ASDAS-ESR mean ± SD	2.39±0.80
ASDAS-CRP mean ± SD	2.58±0.82
MASES (0-13) mean ± SD	3.96±1.73
Thoracal schober (cm) mean ± SD	1.57±0.85
Foot deformity (n%) Halluks valgus Hammer toe	33 (64.7) 17 (33.3) 13 (25.5)
NYPR scale mean ± SD	60.29±16.16
Berg balance scale mean ± SD	51.61±3.81
ASQoL mean ± SD	7.88±5.00
ESR median (min.-max.)	10.00 (2.0-32.0)
CRP median (min.-max.)	4.00 (3.0-55.0)
HLA B27 (n%)	15 (29.4)

BASFI: Bath AS functional index, BASMI: Bath AS metrology index, BASDAI: Bath AS disease activity index, ESR: Erythrocyte sedimentation rate, CRP: C-reactive protein, MASES: Maastricht ankylosing spondylitis enthesitis score, ASQoL: Ankylosing spondylitis quality of life, NYPR: New York Posture Rating scale, SD: Standard deviation, min.-max..: Minimum-maximum, ASDAS: Ankylosing Spondylitis Disease Activity Score, HLA: Human leukocyte antigen

Table 3: Disease-related radiologic measurements

	n=51
MRI	
Sacroiliitis (n%)	36 (70.6)
X-ray	
MSASS score (0-72) mean ± SD	38.70±9.98
Calcaneal inclination angle (18°-29°) mean ± SD	21.76±8.42
Normal (n%)	20 (39.2)
Pes planus (n%)	18 (35.3)
Pes cavus (n%)	13 (25.5)
Meary's angle (0-4°) mean ± SD	10.60±5.74
Normal	19 (37.3)
Mild deformity	24 (47.1)
Moderate deformity	8 (15.6)
Severe deformity	0
Ultrasonography	
SEI score (0-76) mean ± SD	26.54±4.75
GUESS score (0-36) mean ± SD	23.06±4.13
Quadriceps tendon thickness (mm) mean ± SD	4.25±1.16
Proksimal patellar tendon thickness (mm) mean ± SD	3.58±0.73
Distal patellar tendon thickness (mm) mean ± SD	3.29±0.75
Aschill tendon thickness (mm) mean ± SD	4.07±0.95
Plantar fascia thickness (mm) mean ± SD	3.34±0.76

MRI: Magnetic resonance imaging, MSASS: Modified stoke ankylosing spondylitis spinal score, SD: Standard deviation, SEI: Sonographic entheseal index, GUESS: The Glasgow Ultrasound Enthesitis Scoring System

Discussion

The aim of this study was to evaluate the effect of work characteristics with different physical performance demands on axSpA patients. The study showed that increase of physical activity level of the work corresponds to an increase in the severity of disease (BASDAI and ASDAS-ESR). In a similar study, persistent high disease activity trajectories were significantly associated with consequences on work (30). It has been seen (Table 4) that with the increase of work duration, mobility decreases (thoracal Schober), and inflammation increases (MASES and ESR). Enthesopathy in the lower extremity and thickness of related tendons positively correlated with the increase of work duration and physical activity level during work and leisure time (Table 5).

AxSpA causes important physical limitations, functional disabilities and a significantly lower life quality (5,31). The disease affects the young population at employment age, causing a significantly negative effect on working capability and productivity (12). The reflection of these disabilities on socio-economic life makes the disease more impactful. Work productivity is reduced, along with impaired spinal mobility, high disease activity, low quality of life and onset of depression (5-7,9). Two separate studies, where patients were observed for 12 years, have shown that higher physical demand of job types may amplify disease activity and radiological progression (30,32). Discussion of these studies shows that inflammation and mechanical stress may cause radiological progression. A recent review reported that although these studies shed more light into these possible associations, whether these studies are indeed related to the actual job itself or the mechanical stress the job imposes remains to be determined (5).

The effect of mechanical factors was evaluated by posture and balance scales, using radiological and US methods. Our study observed similar results with literature regarding the relation between physical activity level at work, work duration and disease activity (BASDAI, ASDAS-ESR), lack of mobility (BASMI and thoracal Schober) and high inflammation (ESR). Clinical evaluations of posture (NYPR) did not show a relation to work characteristics (Table 4). Fifteen of 51 patients were AS and 36

were nr-axSpA. The fact that NYPR score was not associated with work activity can be explained by the fact that posture is less affected in nr-axSpA patients than in AS patients. Similarly, spinal radiological progression (MSASS) did not indicate a relation to work characteristics. Because 15 of 51 patients were AS and 36 were nr-axSpA. Radiological progression in nr-axSpA patients is less than in AS patients.

SpA is characterized by spinal inflammation, structural damage, spinal stiffness, and lack of mobility (33). Spinal joints and ligaments develop fibrosis, calcification, ossification and ankylose because of spinal inflammation. Additionally, thoracic kyphotic deformity occurs in patients with AS, which causes forward and downward displacement of the center of gravity of the body in the sagittal plane (34). In this situation, compensations such as an increase of flexion at hip/knee and flattening of the lumbar lordosis may occur to sustain erect posture (35). Plantar flexion is reported in some studies (34,35). Our study indicates a similar compensation mechanism. Ultrasonography examination reveals high enthesitis scores of the lower extremity (Table 5). Enthesitis is an inflammation at the sites where tendons, the joint capsule or ligaments insert into the bone (36). Enthesitis often affects the Achilles tendon

Table 4: Correlation between work characteristics and, clinical/laboratory disease parameters

	Work duration rho/p	Work activity level rho/p	Leisure time activity level rho/p
Disease duration (years)	0.109/0.447	0.059/0.680	0.031/0.830
BASFI	0.037/0.734	0.194/0.172	0.010/0.927
BASMI	0.054/0.619	**0.296/0.006**	0.084/0.440
BASDAI	0.165/0.128	**0.298/0.034**	0.096/0.380
ASDAS-ESR	0.197/0.076	**0.409/0.004**	0.191/0.075
ASDAS-CRP	0.044/0.693	0.115/0.433	0.045/0.857
MASES	**0.287/0.007**	**0.455/0.001**	0.144/0.208
Thoracal schober (cm)	**-0.308/0.004**	**-0.414/0.001**	-0.089/0.418
Foot deformity	**0.318/0.005**	**0.316/0.032**	**0.224/0.049**
NYPR	-0.065/0.554	-0.100/0.358	-0.049/0.656
Berg balance scale	-0.175/0.107	-0.137/0.209	-0.092/0.400
ASQoL	0.098/0.367	0.249/0.052	0.265/0.129
ESR	**0.292/0.008**	**0.310/0.032**	0.127/0.283
CRP	0.121/0.281	0.108/0.336	0.119/0.291
HLA-B27	0.081/0.639	0.047/0.776	0.032/0.846

BASFI: Bath AS functional index, BASMI: Bath AS metrology index, BASDAI: Bath AS disease activity index, ESR: Erythrocyte sedimentation rate, CRP: C-reactive protein, MASES: Maastricht ankylosing spondylitis enthesitis score, ASQoL: Ankylosing spondylitis quality of life, NYPR: New York Posture Rating scale, rho: Spearman correlation coefficient, ASDAS: AS disease activity score, HLA: Human leukocyte antigen

Table 5: Correlation between work characteristics and radiological parameters

	Work duration rho/p	Work activity level rho/p	Leisure time activity level rho/p
MRI			
Sacroiliitis	0.037/0.817	0.249/0.112	0.072/0.651
X-ray			
MSASS score (0-72)	0.007/0.955	0.058/0.639	0.090/0.481
Calcaneal inclination angle (18°-29°)	0.055/0.633	**-0.332/0.006**	0.094/0.450
Meary's angle (0-4°)	0.123/0.320	0.029/0.816	0.085/0.492
Ultrasonography			
SEI score	**0.314/0.015**	**0.203/0.021**	**0.141/0.035**
GUESS score	**0.256/0.019**	**0.138/0.027**	**0.186/0.024**
Quadriceps tendon thickness (mm)	0.122/0.272	0.146/0.201	0.017/0.876
Proksimal patellar tendon thickness (mm)	0.071/0.526	0.125/0.260	0.153/0.180
Distal patellar tendon thickness (mm)	**0.315/0.004**	**0.285/0.009**	**0.116/0.018**
Aschill tendon thickness (mm)	**0.156/0.038**	**0.254/0.020**	0.055/0.622
Plantar fascia thicknes (mm)	0.076/0.492	**0.154/0.025**	0.157/0.352

MRI: Magnetic resonance imaging, MSASS: Modified stoke ankylosing spondylitis spinal score, SEI: Sonographic entheseal index, GUESS: The Glasgow Ultrasound Enthesitis Scoring System, rho: Spearman correlation coefficient

and the connected joint in SpA patients. However, enthesopathy may occur on any joint. Literature shows a negative relationship between enthesitis and postural control (37-39). Enthesitis might be the cause of the high visual posture analysis scores in our study.

In addition, increase of physical activity and work duration may cause an increase in thickness at distal patellar and Achilles tendons (Table 5). Plantar fasciitis caused by work physical activity is an example of enthesopathy caused by a high mechanical workload. Studies show that the formation of enthesitis may be induced by mechanical stress (32,40,41). In our study, the thickness of the distal patellar tendon increased proportionally to mechanical workload, because the thickness of tendon is a symptom of acute inflammation (28). Literature shows that enthesitis is related to high disease activity in AS patients (32,36,38,41). In our study, disease activity is lower compared to other studies. This situation suggests that BASDAI and ASDAS scores, which include parameters like weakness, fatigue, peripheral joint swelling, pain and morning stiffness, do not reflect the level of inflammation sufficiently.

Study Limitations

The most important limitation of our study is the lack of a control group. Unfortunately, normal values of tendon thickness are not available for ages, gender and country. It is necessary to have wide-scale studies with a control group to better understand, testify and compare our results. Our other limitation was the small number of patients. We had to conduct the study on a restricted profile of patients due to the requirement of stable job conditions: patients who changed or quit their jobs within one year were excluded. Although our HLA-B27 result is lower than the studies in the literature, there are also studies with a low HLA-B27 value (42,43). The reason for this, the small number of patients in this study and may include different ethnic structure of the country.

Conclusion

In conclusion, we observed that physical activity level at work in axSpA patients is related to the severity of disease activity and decreased spinal mobility. In particular, increase of mechanical workload causes acute inflammation at lower extremity and all enthesopathy points, independent from radiological progression and disease activity. The addition of US examination may provide a better evaluation of the effects of physical activity level at work on SpA patients.

Ethics

Ethics Committee Approval: Approval of the study was obtained from University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Clinical Research Ethic Committee (approval no: 98/03, date: 19.10.2020).

Informed Consent: Informed consent forms were signed upon admission to the trial.

Peer-reviewed: Externally peer-reviewed.

Authorship Contributions

Concept: N.G., Design: N.G., Data Collection and Processing: N.G., F.H.Ş., E.K.U., R.S. Statistical Analysis: B.K., E.K.U Literature Search: N.G., E.K.U., B.K., Writing: N.G., E.K.U., B.K.

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