Research Article

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The Relationship Between Foot Symptoms With Disease Activity And Functional State In Patients With Rheumatoid Arthritis

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Aim: Foot and ankle joints are among the joints evaluated in Rheumatoid Arthritis (RA), but not for the calculation of Disease Activity Score-28 (DAS28). The aim of the study is to evaluate the frequency of foot complaints in RA patients and to investigate the relationship between DAS28 and foot complaints and functional statuses. Method: DAS28 (with Erythrocyte Sedimentation Rate), Health Assessment Questionnaire (HAQ), Foot Function Index (FFI), Foot Function Index Pain subscale (FPI), Foot Function Index Deficiency subscale (FDI), Foot Function Index Limitation subscale (FLI), 6-meter (mt) walking time, Visual Analog Scale (VAS) are used to investigate the relationship between DAS28 and other index and scales. Results: 103 patients with RA are included in the study. 91.3% of the patients are female and 8.7 % are male. 66% of the patients have foot and ankle complaints and 34% have no complaints. It is observed that DAS28 is correlated positively with VAS ($p<0.001$, $r=0.702$), HAQ ($p<0.001$, $r=0.530$), FPI ($p<0.001$, $r=0.490$), FLI ($p=0.002$, $r=0.311$), FDI ($p<0.001$, $r=0.495$), FFI ($p<0.001$, $r=0.485$), 6 mt walking time ($p=0.049$, $r= 0.198$) and Erythrocyte Sedimentation Rate ($p<0.001$, $r=0.57$) respectively . In addition, it is observed that FFI is correlated positively with duration of disease ($p=0.015$, $r=0.226$), body mass index ($p=0.002$, $r=0.292$), VAS ($p<0.001$, $r=0.639$), HAQ ($p<0.001$, $r=0.376$), 6 mt walking time ($p<0.001$, $r =0.551$) and the Erythrocyte Sedimentation Rate ($p<0.001$, $r=0.247$). Conclusion: Foot complaints in patients with RA are seen at high rates. Despite the extent of the problem, the rheumatoid foot is neglected. Patients with foot complaints are more likely to have higher inflammatory levels and have more functional limitations. The DAS28 score can also be used for follow-up in patients with foot complaints. In addition, foot complaints must be questioned and clinical and functional follow-up should be done. FFI and subscores can be used in evaluating and following foot complaints in patients with RA.

Keywords: DAS28 ● foot ● foot function index ● rheumatoid arthiritis

Introduction

Rheumatoid Arthritis (RA), signs and symptoms of the feet are common. More than 90% of RA patients complain of foot or ankle problems for a while in the course of the disease [1]. The majority of RA patients presents arthritis of the feet and 20% of them have radiographic damage at the time of diagnosis [2]. It is stated that foot involvement is neglected in RA, and studies on disease activity and foot involvement are needed [3].

The ultimate treatment goals in RA are to relieve pain, slow the progression of joint destruction and achieve remission [4]. Monitoring disease activity is important for disease monitoring and strict control. DAS28 is a valid and common tool for measuring and evaluating disease activity [5,6]. According to the American College of Rheumatology (ACR), foot and ankle joints are found within the joints evaluated in the RA classification criteria [7]. But DAS28 is not included in the foot and ankle joints. This situation led to the discussion of the fact that both the actual activity account could be misleading and that the joints could be neglected when evaluating the patients.

In our study, we evaluated the frequency of foot complaints in RA and investigated the relationship between DAS28 and foot complaints and functional status.

Method

We performed a face to face cross-sectional observational study. 103 consecutive RA patients of the outpatient. They have to meet the 1987 or 2010 ACR criteria for RA. Patients with a good mental capacity above the age of 18 are included. Patients who underwent surgery for the lower extremity for any reason are excluded from the study. The local ethical committee approved this study and a written informed consent was is obtained from each patient.

The following demographic and clinical variables are collected: age, sex, disease duration, and painful or swollen joints in the foot. Body Mass Index (BMI) was is calculated. All patients' shoes and socks are removed and foot examinations are performed. On physical examination, the number and distribution of swollen, tender joints are recorded.

DAS28 is calculated with sedimentation rate for disease activity assessment. Disease activity was expressed as a composite index consisting of a swollen and painful joint count of 28 joints, the Erythrocyte Sedimentation Rate (ESR in mm/hour) and a visual analogue scale (VAS) for general health [8].

Function was measured by the following variables: Health Assessment Questionnaire (HAQ), 5-Foot Function Index (5-FFI), 6 meter walking test, Visuel Anolog Scala (VAS). The HAQ has been developed by Fries et al. and was adapted for the Turkish population [9]. The questionnaire consists of eight categories, which represent the activities of daily living, and for each category, there are two to four questions. The responses are scored on a fourpoint scale: 0; without difficulty, 1; with some difficulty, 2; with difficulty and 3; impossible. The questionnaire has a final column in which respondents can indicate the use of any aid or device. The use of any of these devices is scored by at least a 2. The highest score for each of the eight categories is taken as the score for that category. The final score of the questionnaire is the averaged score of all the categories and ranges between 0 and 3.

Patients with foot complaints were are also asked to answer a total of 23 questions; evaluating 9 foot pain, 9 inadequacy and 5 limitations for calculating the Foot Function Index. Foot Pain Index, Foot Insufficiency Index, Foot Activity Index, and Foot Function Index are calculated.

The FFI measures pain and mobility limitation as an impact of foot problems. The scale consists of 23 items divided into 3 subscales: pain (9 items), physical functioning (9 items) and limitation (5 items) (16). The items are rated on a 5 point-scale, which is a modification by Kuyvenhoven et al. (The original FFI uses VAS scales.) [10]. To calculate the subscale-scores and the total score, the item scores are summed up, divided by the maximum possible sum of the item scores and then multiplied by 100. The scores range from 0 to 100; the higher the score, the more pain, disability and limitation, respectively. Although it was first applied in patients with RA, its use is not limited to this population, and its validity and reliability in non-systemic foot and ankle problems are reported by Agel et al. [11] It was adopted for Turkish population [12].

In the study patients are asked to walk a distance of 6 meters marked on the flat ground. This time is measured in seconds with a stopwatch.

Statistical analysis

The association between the signs, symptoms, damage, and function parameters are calculated using Pearson's correlation. For the data analysis, we used the Statistical Package for the Social Sciences (SPSS 22.0). p values are taken as 0.05 in all statistics.

Results

The characteristics of the patients are shown in **Table 1**. 103 patients were are analysed; 94 women and 9 men. The mean age of 103 RA patients included in the study is 55.8 ± 12.6 years (median 56 years, 23-80 years. 91.3% (n = 94) of the patients are female and 8.7% (n = 9) are male. 94 female and 9 male patients were are included in the study and the ratio of female patients with more than 10 folds is higher than the average female / male ratio which is accepted as 3 in the literature [13]. Within the scope of the study, women are not particularly preferred among the patients who applied to the outpatient clinic and the study is mentioned to the patients who applied in turn.

It is found that the mean of disease duration of 103 patients is 12.6 ± 9.9 (median 10, 1-50) years, and the BMI mean is 28.7 ± 5.9 (median 17.7, 27.4-51.8). The mean of duration of education is 5.6 ± 3.8 years (median 5, range 0-16). While 75.73 % (n = 78) of the patients did does not smoke, 24.27 % (n = 25) of them smokes.

While 66.02 % (n = 68) of the patients states that they had complaints of foot and ankle, 33.98% (n = 35) have

no complaints. Table 2 presents Pearson's correlation coefficients of the between DAS28 and age, disease duration, BMI, VAS, HAQ, FFI, FPI, FLI, FDI, 6 mt walking time. Also the correlation between DAS28 and swelling and tenderness in joints not included in DAS28 on foot is investigated. Table 3 presents Pearson's correlation coefficients of the between FFI and disease duration, BMI, VAS, HAQ, ESH, 6 mt walking time.

Discussion

The aim of the present study is to assess the relationship between disease duration and foot function, pain and disability in patients with RA-related foot complaints. In our study, 66% of 103 RA patients have foot complaints. This ratio is consistent with the 60-90% of the literature [14-17]. In an epidemiological study of 585 RA patients in England, 93.5% of the participants reported that they had foot pain [15]. But the pain in the foot was not evaluated by FFI or any accepted scale. The daily routine and last one month are questioned as pain/absent. In this epidemiological study, the pain of female participants is found to be more severe and it was is suggested that this could be related to the use

Table 1. Characteristics of the patients (n =103).

Age (years)[a]	**55,8**	**12,6**
Sex (F/M)[b]	91/9	
Smoking (Y/N)[b]	24/76	
Disease duration[a]	12,6	9,9
BMI[a]	28,7	5,9
DAS28[a]	3,6	1,3
HAQ[a]	0,7	0,6
FFI[a]	58,4	20,5
FPI[a]	63,8	21,6
FDI[a]	65,5	20
FLI[a]	38,2	29
6 mt walking time[a]	8,8	7,7
ESH[a]	23	19
Foot complaint(Y/N)[b]	34/66	
Number of tender joints not included in DAS28	0,7	0,3
Number of swallen joints not included in DAS28	3	1,8
Data are means (SD)a, % b, Y:yes, N: no		

Table 2. Correlation relationship between DAS28.

		DAS28
Age (year)	r	-0.087
	p	0.392
Disease duration	r	0.13
	p	0.14
BMI (kg/cm2)	r	0.045
	p	0.654
VAS (mm/100)	r	0.702
	p	0.000*
HAQ	r	0.53
	p	0.000*
FFI	r	0.485
	p	0.000*
FPI	r	0.49
	p	0.000*
FDI	r	0.495
	p	0.000*
FLI	r	0.311
	p	0.002*
Tender joints not included in das28	r	0.286
	p	0.004*
Swollen joints not included in das28	r	0.237
	p	0.018*
6 mt walking time (sn)	r	0.198
	p	0.049*

BMI: Body Mass İndex; VAS:Visual Analog Scale; HAQ: Health Assessment Questionnaire; FFI: Food Fonction İndex; FPI: Foot Function İndex Pain Subscale; FDI: Foot Function İndex Deficiency Subscale; FLI: Foot Function İndex Limitation Subscale; mt: Meter; Pearson Correlation Analysis; r: Correlation Coefficient
*Since P <0.05, there was a correlation between values

Table 3. Correlation relationship between FFI.

		FFI
Disease duration	r	0.226
	p	0.015*
BMI (kg/cm^2)	r	0.292
	p	0.002*
VAS (mm/100)	r	0.639
	p	0.000*
HAQ	r	0.376
	p	0.000*
6 mt walking time	r	0.551
	p	0.000*
ESH	r	0.247
	p	0.000*

p: Pearson correlation analysis; r: correlation coefficient
* Since P <0.05, there was a correlation between values

of shoes. It is also associated with BMI and duration of disease with foot pain. The number of male patients included in our study is very small (8.7%), so we could not comment on the gender difference. In our study, a significant relationship is found between FFI and BMI and disease duration.

Landewe et al. questioned the validity of the cut-off point for remission with DAS28, mainly because the feet / ankles are not evaluated [18]. Son et al. reported that residual disease activity was frequently observed in ankle and foot joints in patients with remission according to DAS28 [4].

However, recent reports suggest that DAS28 is statistically significantly correlated with the Disease Activity Index, including metatarsophalangeals (MTF) or ankle joints. Kapral et al, 28 joints and ankles, foot MTF joints, including 32 joint activities comparing disease activity, concluded that the frequency of remission did not change [19].

van der Leeden et al, in patients with RA-related foot complaints, aims to assess the relationship between duration of the disease and foot function, pain and inadequacy. They used FFI and 10 mt walking test and DAS44 [1]. There was correlation between the duration of disease and the pain subscale of the FFI. There was a significant relationship between the duration of the disease and walking time in their study. There was also no significant relationship between DAS44 and disease duration in their study. Similarly, in our results, there was is no relationship between DAS28 and disease duration. However, in our study, the duration of the disease and FFI is significantly correlated (**Figure 1**).

In our study, we performed a 6 mt walking test. We investigated the relationship between DAS28 and 6 meters walking time and found a significant correlation. In addition, we found a significant relationship between walking time and FFI. A significant correlation was found between DAS28 and FFI and between DAS28 and FFI sub-scores. When we look at the literature, we have not found any previous studies investigating the relationship between DAS28 and FFI.

Baan et al. reported that pain and disease duration significantly affected HAQ-DI and FFI more than radiological damage [20]. In their studies, there was no relationship between HAQ and FFI. They said that the reason for this is that the number of patients is limited to 30. In our study, a significant relationship is found between HAQ and FFI in our evaluation with 68 patients with foot complaints (**Figure 2**).

DAS28 is a practical monitoring score in polyclinic follow-up. Hand joints are easy to evaluate and take less time than foot joints. Recent studies have shown that when the original criteria and the shortened DAS28 criteria are compared, remission rates do not change, but moderate and high disease activity group evaluation may affect treatment decisions. We suggest that in RA

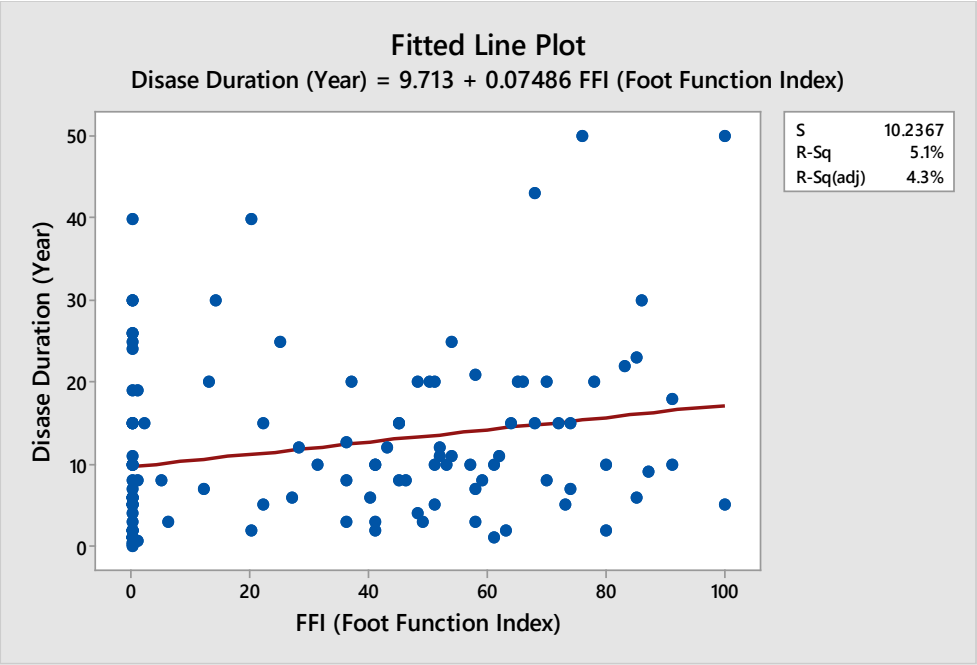

Figure 1. Graph Showing Duration of the disease and FFI.

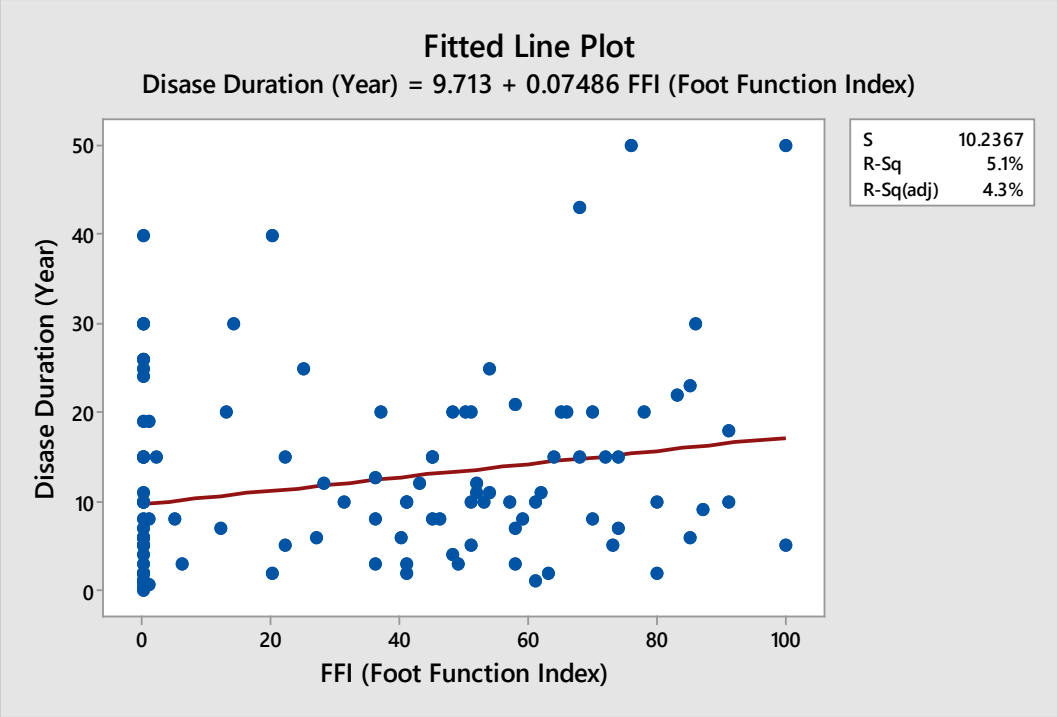

Figure 2. Graph showing HAQ and FFI.

patients, pain and swelling of the foot joints should be paid attention to. FFI and subscores can be used in evaluating and following in patients with RA-related foot complaints. FFI and subscores can be used in evaluating and following foot complaints in patients with RA.

Conclusion

Foot complaints in patients with RA are seen at high rates. Despite the extent of the problem, the rheumatoid foot is neglected. Patients with foot complaints are more likely to have higher inflammatory levels and have more functional limitations. The DAS28 score can also be used for follow-up in patients with foot complaints. In addition, foot complaints must be questioned and clinical and functional follow-up should be done. FFI and subscores can be used in evaluating and following foot complaints in patients with RA.

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