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Pulmonary and cardiac involvement in patients with rheumatoid arthritis and ankylosing spondylitis

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ABSTRACT

Objectives: Our aim is to study the disease activity status, laboratory data and to determine the frequency of cardiac and pulmonary findings in patients with Rheumatoid arthritis (RA) and ankylosing spondylitis (AS).

Methods: Forty-five AS patients and 78 RA patients took part in the study. The C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), albumin, creatinine, ALT, leukocyte, neutrophil ratio, hemoglobin, platelet, rheumatoid factor (RF), and anti-cyclic citrullinated peptide (anti-CCP) levels were measured. In addition, the patients' thoracic computed tomography, high-resolution computed tomography (HRCT), echocardiography (ECHO), and pulmonary function test (PFT) results were evaluated. Disease activity was assessed with the Disease Activity Score-28 (DAS-28) in RA patients, whereas the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) was used in patients with AS.

Results: The relationship between the anti-CCP value and gender was significant in RA patients. Significant differences were present between gender and hemoglobin value in RA and AS patients, whereas no significant differences were determined between CRP, ESR, platelet, and DAS-28 values. There was a significant difference between RF and ESR values in RA patients, whereas no significant difference was present between CRP, leukocyte, DAS-28, hemoglobin, and platelet values. Pulmonary involvement was determined in 35.7% of RA patients and 4.2% of AS patients. The difference between these was statistically significant.

Conclusions: The most common pulmonary involvement is millimetric nonspecific nodule and the most common lesion among ECHO findings was left ventricular diastolic dysfunction in RA and AS patients. In RA, no significant difference was determined between PFT and DAS-28 results, as a result, the disease activity will not directly indicate pulmonary involvement.

Keywords: Rheumatoid arthritis, ankylosing spondylitis, high-resolution computed tomography

Rheumatoid arthritis (RA) is a chronic, autoimmune, multisystemic, inflammatory disease with unknown etiology and characterized by joint destruction due to synovial cellular proliferation and inflammation [1-3]. Despite treatment, it usually has a clinical course with exacerbations, resulting in progressive joint destruction, deformity, disability, and sometimes early mortality. In addition, the disease's extra-articular manifestations are also common, and sometimes with a severe clinical course [4, 5]. Females are affected 2-3 times more commonly than males. On the other hand, RA may manifest at any age and is most common between 40-50 years of age.

Even though RA is a disease primarily affecting

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the joints, it is a systemic disorder that might involve every organ system [6]. RA's extra-articular manifestations are more common in patients with active severe articular manifestations and in Rheumatoid factor (RF) (+) cases [7]. The serum concentration of CRP increases rapidly and dramatically following the inflammatory stimulus, in line with the amount of tissue damage [8].

Pulmonary involvement in RA is more common in males than females. The primary predisposing factors for pulmonary involvement in RA are middle age, male gender, severe destructive arthritis, excessively elevated RF titers, subcutaneous nodules, and extra-articular involvements [9]. The most classical type of parenchymal involvement in RA is diffuse interstitial fibrosis, and its most frequent finding is bilateral basilar interstitial involvement on posteroanterior chest X-rays, often presenting asymmetrically. Involvement starts with a patchy alveolar infiltration and then proceeds to a reticulonodular pattern. The pulmonary disorder may also occur because of direct pulmonary toxicity due to drugs or other agents used in RA treatment or infection secondary to immunosuppressive use (e.g., glucocorticoids, antimetabolites, anti-cytokine treatment).

Clinically overt pericarditis or myocarditis is not commonly observed in RA's cardiac involvement. Instead, coronary artery disease, heart failure, and atrial fibrillation are more common in RA patients [9, 10]. The clinical features of pericarditis are present in less than 10% of patients. Pericardial effusion is detected in echocardiographic examination with no clinical signs in approximately 30% of patients [11]. Myocarditis may be granulomatous or interstitial-type, rare in RA, and associated with an active articular disease or other non-articular involvements [6]. Valvular failures and heart blocks may occur because of rheumatoid nodules, which can develop in pericardium, myocardium, and valvular structures [7].

Ankylosing spondylitis (AS) is a chronic, progressive, systemic, inflammatory disease with unknown etiology, primarily involving the sacroiliac joints and axial skeleton, which may also manifest peripheral articular involvement. It is the prototype of spondyloarthritis (SpA)-group disorders. [12]. Even though AS manifests more commonly in the second and third decades of life, it is distributed in a wide age range, including the pediatric and geriatric age groups [13]. Males are more commonly affected than females, with a ratio of approximately 2-3/1. Erythrocyte sedimentation rate (ESR) and C-Reactive Protein (CRP) levels are not well-correlated with the axial disease activity, but they may better correlate with peripheral arthritis. Normochromic normocytic anemia is common and is typical in the very active disease form [14, 15].

The risks for aortic insufficiency and cardiovascular involvement are increased in AS. The incidence of aortic insufficiency is 6-10%, and conduction-type problems are met in 3-33% of patients [16-19]. Moreover, the risks for other cardiovascular diseases are also increased in AS.

Pulmonary problems occur due to musculoskeletal disease-related restrictive changes, pulmonary interstitial nodules, and parenchymal changes. Restrictive pulmonary disease is usually associated with reduced thoracic wall and spinal mobility. As a result, the vital capacity is reduced, whereas the functional residual capacity is increased. In a small number of patients, approximately 1.3-1.5%, signs such as apical pulmonary fibrosis are observed in plain chest x-ray [20-23]. Apical fibrosis is usually asymptomatic and associated with prolonged disease duration. The mosaic pattern, subpleural nodules, and parenchymal bands are high-resolution computed tomography (HRCT) findings that can also be observed in the disease's early period [22, 23].

METHODS

Study Design and Patients

The study was conducted on a total of 123 patients [RA 63.4% (n = 78), AS 36.6% (n = 45)] who were admitted to the Outpatient Immunology / Rheumatology Clinic of Karadeniz Technical University Medical Faculty. Forty-five AS patients, consisting of 26 (57.8%) females, and 19 (42.2%) males, aged between 18-82 years, diagnosed and followed up according to the modified New York 1984 criteria, and 78 RA patients, consisting of 57 (73.1%%) females, and 21 (26.9%) males, aged between 26-86 years, diagnosed and followed up according to the 2010 ACR/EULAR criteria were included in the study.

The patients' medical histories and physical exam-

ination results were reviewed. In addition, the computed chest tomography, HRCT, echocardiography (ECHO), and pulmonary function test (PFT) results were evaluated and recorded. FEV1 (1-second forced expiratory volüme) (%, L), FVC (forced vital capacity (%, L), and FEV1/FVC ratio were recorded. In addition, CRP, ESR, albümin, creatinine, ALT, leukocyte, neutrophil %, hemoglobin, platelet count, RF, and anti-CCP were recorded. In RA patients' disease activity assessment with DAS-28, for joint examination, two shoulders, two elbows, two wrists, ten metacarpophalangeal (MCP) joints, ten proximal interphalangeal (PIP) joints, and two knee joints were evaluated regarding tenderness and swelling. The tender joint count (TJC) and swollen joint count (SJC) were calculated. For DAS-28 scoring, the erythrocyte sedimentation rate (ESR) and 43-general health status (GHS) values were required, and the following formula was used; all these parameters and calculators, prepared specifically for DAS-28, were used with a constant formula- DAS-28 = (0.56×TJC) + (0.28×√SJC) + (0,70 log ESR) + (0.014×GHS). In AS patients, BASDAI was used for disease activity assessment in clinical evaluation.

Inclusion and Exclusion Criteria and Definitions

Among RA patients, those who were seropositive, and among AS patients, those who were HLA-B27 positive were included in the study. The study's exclusion criteria were determined as age under 18 years, not being seropositive for RA patients, and lack of HLA-B27 positivity for AS patients.

Statistical Analysis

Descriptive statistics of evaluation results were presented as the number and percentage for categorical variables and the mean, standard deviation, minimum and maximum for quantitative variables. The conformity of quantitative variables with a normal distribution was evaluated with the Kolmogorov-Smirnov test. Regarding comparisons of quantitative variables between two independent groups, the Student T-test was used when prerequisites for normal distribution were met, and the Mann-Whitney U test was used when they were not. Differences between the ratios of categorical variables in independent groups were tested with Chi-Square Analysis. Spearman's test calculated correlation coefficients and statistical significance for the relationships between quantitative variables. Data were analyzed with SPSS 13.0 statistical package software. $P < 0.05$ was considered the level of statistical significance.

RESULTS

Forty-five AS patients, consisting of 26 (57.8%) females, and 19 (42.2%) males, aged between 18-82 years, and 78 RA patients, consisting of 57 (73.1%%) females, and 21 (26.9%) males, aged between 26-86 years, were included in the study. The mean age was 57.60 ± 13.124 years in RA patients and 45 ± 14.618 years in AS patients. The gender distributions of AS patients and RA patients were presented in Table 1.

RA- Signs of PulmonaryIinvolvement

In the patients with RA, the HRCT findings were as follows: millimetric nonspecific nodule - 15 (34.1%) cases; the atelectatic band – 8 (18.2%) cases; fibrosis – 7 (15.9%) cases; atelectasis – 6 (14.3%) cases; ground glass appearance – 5 (11.4%) cases; tubular bronchiectasis – 3 (7.1%) cases; emphysematous changes – 3 (6.8%) cases; tractional bronchiectasis – 2 (4.5%) cases; honeycomb – 2 (4.5%) cases; subpleural cyst – 1 (2.4%) case; chronic interstitial pulmonary disease – 1 (2.4%) case; septal thickening – 1 (2.4%) case.

The chest CT findings of the RA patients were as follows: multiple lymph nodes sized < 10 mm – 27 (50.9%) cases; a nodule sized < 5 mm – 17 (32.1%) cases; the atelectatic band – 17 (32.1%) cases; millimetric nonspecific nodule – 11 (20.8%) cases; fibrotic

Table 1. Participant characteristics

Parameter	Rheumatoid arthritis	Ankylosing spondylitis
Gender, n (%)		
Female	57 (73.1)	26 (57.8)
Erkek	21 (26.9)	19 (42.2)
Age (years)		
Minimum	26	18
Maximum	86	82
Mean ± SD	57.60 ± 13.124	45 ± 14.618

SD = standard deviation

Table 2. **The pulmonary function test results in the patients with RA and AS**

	RA/AS	Min-Max (RA/AS)	Mean ± SD (RA/AS)
FEV1/FVC	37/28	48/71-100/98	77.89 ± 11.983/ 86.68 ± 8.010
FEV1 (L)	37/28	0.78/1.45-4.21/4.48	2.277 ± 0.838/ 2.962 ± 0.814
FVC (L)	37/28	1.25/1.81-5.10/5.67	2.960 ± 1.014/ 3.462 ± 1.041
FEV1 (%)	37/28	40/62-144/153	98.46 ± 23.246/ 106.43 ± 21.488
FVC (%)	37/28	53/53-135/159	96.89 ± 20.795/ 97.54 ± 24.406

AS = ankylosing spondylitis, RA = rheumatoid arthritis, FEV1 = 1-second forced expiratory volüme, FVC = forced vital capacity, SD = standard deviation, Min =minimum, Max = maximum

Table 3. **The PFT results and HRCT findings in RA patients**

	n	Mean ± SD	*p* value
FEV1/FVC			0.78
Pulmonary Finding (+)	18	74.8± 12.25	
Pulmonary Finding (-)	10	76.22± 12.698	
FEV1 (L)			0.87
Pulmonary Finding (+)	18	2.32± 0.811	
Pulmonary Finding (-)	10	2.26± 0.841	
FVC (L)			0.71
Pulmonary Finding (+)	17	3.16± 1.14	
Pulmonary Finding (-)	10	3.01± 0.931	
FEV1 (%)			0.9
Pulmonary Finding (+)	18	96.7± 20.49	
Pulmonary Finding (-)	10	97.89± 25.254	
FVC (%)			0.91
Pulmonary Finding (+)	18	98.1± 25.062	
Pulmonary Finding (-)	10	97.17± 18.03	
DAS-28			0.5
Pulmonary Finding (+)	15	3.238± 1.3791	
Pulmonary Finding (-)	27	2.975± 0.6801	

RA = rheumatoid arthritis, PFT = pulmonary function test, HRCT = high-resolution computed tomography, DAS-28 = disease activity score-28, FEV1 = 1-second forced expiratory volüme, FVC = forced vital capacity, SD = standard deviation

retraction/change – 8 (15.1%) cases; lymphadenopathies sized > 10 mm – 7 (13%) cases; emphysematous changes – 4 (7.5%) cases; cardiomegaly – 2 (3.8%) cases.

AS- Signs of Pulmonary Involvement

In the patients with AS, the HRCT findings were identified as follows: the atelectatic band – 7 (28%) cases; the millimetric nonspecific nodule – 7 (28%) cases; atelectasis – 1 (4.2%) case; tractional bronchiectasis – 1 (4.2%) case.

The distribution of chest CT findings in AS patients was as follows: the millimetric nonspecific nodule – 8 (24.2%) cases; a nodule sized < 5 mm – 8 (24.2%); the atelectatic band – 7 (21.2%) cases; fibrotic retraction/change – 7 (21.2%) cases; lymphadenopathies sized > 10 mm – 4 (12.1%) cases; multiple lymph nodes sized <10 mm – 3 (9.1%) cases; emphysematous changes – 2 (6.1%) cases; cardiomegaly – 2 (6.1%) cases.

PFT Results

PFT results, consisting of values for FEV1/FVC, FEV1 L, FVC L, FEV1 %, FVC % minimum, maximum, mean, and standard deviation, in the patients with RA and AS were presented in Table 2.

The PFT Results and HRCT Findings in RA Patients

The pulmonary function test results were compared to HRCT findings in RA patients. No significant differences regarding the FEV1/FVC, FEV1 L, FVC L, FEV1 %, FVC % values, and the DAS-28 score were determined between the groups with and without pulmonary involvement (p = 0.776, p = 0.868, p = 0.709, p = 0.900, p = 0.910, and p = 0.497, respectively). The PFT results and HRCT findings in RA patients were presented in Table 3.

The HRCT findings were compared according to gender in the patients with RA. No pulmonary finding was present in 37 (84.1%) female patients, whereas seven (15.9%) patients presented with pulmonary findings. On the other hand, while no pulmonary finding was present in 13 (59.1%) male patients, nine (40.9%) patients presented with pulmonary findings. However, the difference between male and female groups was not statistically significant (p = 0.054).

The patients with RA were compared to those with AS regarding their HRCT findings. Pulmonary involvement was not identified in 64.3%, whereas it was present in 35.7% of RA patients. In AS patients, no pulmonary involvement was identified in 95.8% of them, whereas only 4.2% of AS patients manifested pulmonary involvement. The difference between the RA and AS groups was statistically significant (p = 0.01). The HRCT findings in RA and AS patients were presented in Table 4.

Table 4. The HRCT findings in RA and AS patients

	Pulmonary Finding (-)	Pulmonary Finding (+)	**Total**
RA			
n	27	15	42
%	64.3	35.7	100
AS			
n	23	1	24
%	95.8	4.2	100

AS = ankylosing spondylitis, RA = rheumatoid arthritis, HRCT = high-resolution computed tomography, p = 0.01

Table 5. The ECHO results of the patients with RA and AS

Finding	**RA n (%)**	**AS n (%)**
Left ventricular hypertrophy	22 (39.3)	8 (25.8)
Left atrial dilatation	10 (18.9)	3 (9.7)
Valvular disease	12 (22.2)	8 (45.2)
Left ventricular systolic dysfunction	5 (9.3)	0 (0)
Left ventricular diastolic dysfunction	42 (75)	14 (45.2)
Dilatation of pulmonary artery	2 (3.8)	3 (9.7)
Dilatation of ascending aorta	15 (26.8)	4 (12.9)
Right ventricular systolic dysfunction	3 (5.4)	0 (0)
Pericardial effusion	0 (0)	0 (0)
IVS hypertrophy	1 (1.8)	1 (3.2)
Sinus of valsalva aneurysm	1 (1.8)	1 (3.2)

AS = ankylosing spondylitis, RA = rheumatoid arthritis, ECHO = echocardiography

RA/AS Findings of Cardiac Involvement

The most common lesion among ECHO findings was left ventricular diastolic dysfunction in RA and AS patients, with ratios of 75% and 45.2, respectively. The distributions of ECHO findings in RA and AS patients were presented in Table 5.

Laboratory Findings

RA patients were grouped according to their RF values being low (< 10.2) and high (> 10.2) and compared regarding gender. While seven female patients had a low RF value, in 49 females, the RF level was high. Only one had a low RF value in male patients, whereas 20 males had high RF values. The difference was not statistically significant ($p = 0.435$).

The patients diagnosed with RA were grouped according to their anti-CCP values being low (< 0.5) and high (> 0.5), and then, the two groups were compared regarding gender.

While 14 of the female patients were determined to have a low anti-CCP value, in 43 females, the level of anti-CCP was high. None of the males had a low anti-CCP value, while it was high in 20 males. The difference between the two genders was statistically significant ($p = 0.016$).

The RA patients, divided into two groups according to their anti-CCP values as low and high, were compared regarding the CRP value. Sixty-two patients were in the anti-CCP-high group and had a mean CRP value of 1.48, whereas the anti-CCP-low group had fourteen patients with a mean CRP level of 2.05. However, the difference between the two groups was not statistically significant ($p = 0.288$).

In RA patients, the CRP, ESR, hemoglobin, platelet, leukocyte, and DAS-28 values were compared according to gender. While there was a significant difference between the hemoglobin value and gender, there were no significant differences in other parameters ($p = 0.550$, $p = 0.850$, $p = 0.011$, $p = 0.360$, $p = 0.084$, and $p = 0.729$, respectively).

In patients with AS, the CRP, ESR, hemoglobin, platelet, leukocyte, and BASDAI values were compared according to gender. While there was a significant difference between the hemoglobin value and gender, there were no significant differences in other parameters ($p = 0.174$, $p = 0.301$, $p < 0.001$, $p = 0.519$, $p = 0.689$, and $p = 0.089$, respectively).

RF values in RA patients were grouped as < 10.2 low, 10.2-720 high, > 720 very high. Anti-CCP values were grouped as < 0.5 low, 0.5-200 high, > 200 very high. The RF and Anti-CCP values in RA patients were presented in Table 6.

Table 6. RF and Anti-CCP values distribution in RA patients

Parameter	RF n (%)	Anti-CCP n (%)
Low	8 (10.4)	14 (18.2)
High	63 (81.8)	41 (53.2)
Very high	6 (7.8)	22 (28.6)
Total	77 (100)	77 (100)

RF, Rheumatoid factor, anti-CCP = anti-cyclic citrullinated peptide

DISCUSSION

The most common pulmonary involvement is millimetric nonspecific nodule and the most common lesion among ECHO findings was left ventricular diastolic dysfunction in RA and AS patients. No significant differences regarding the PFT values, and the DAS-28 score were determined between the groups with and without pulmonary involvement in RA patients. The HRCT findings were compared according to gender in the patients with RA. However, the difference between male and female groups was not statistically significant. Pulmonary involvement was not identified in 64.3%, whereas it was present in 35.7% of RA patients. In AS patients, no pulmonary involvement was identified in 95.8% of them, whereas only 4.2% of AS patients manifested pulmonary involvement.

There is no specific indicator of the disease activity in ankylosing spondylitis. The investigators' views on this subject are controversial. Numerous methods have been developed to evaluate the disease activity-related symptoms and signs of AS. For this reason, the AS patients are assessed together with their clinical features, laboratory results [erythrocyte sedimentation rate (ESR), C-reactive protein (CRP)], and radiological findings. On the other hand, ESR and CRP are weakly correlated with BASDAI, and their predictive

values are low [24]. Bostan *et al*. [25], in their study assessing the disease activity with various clinical scales, stated that it was better correlated with CRP than other laboratory parameters.

The literature review revealed that high ESR and CRP levels were not typical in AS. Besides, some publications have stated that they were not well-correlated with clinical activity and radiological progression [24, 26].

In the study published by Pinheiro *et al*. [27] in 2003, an anti-CCP positivity was present in 120 of 150 RA patients with a mean disease duration of 12 years, and anti-CCP was negative in 30 patients. In addition, they determined a strong correlation between anti-CCP positivity and the DAS-28 score (r = 0.82). They showed that the presence of anti-CCP was associated with high disease activity [27]. Anti-CCP positive RA patients were reported to have higher disease activity and DAS-28 scores than anti-CCP negative RA patients. However, the same investigators could not determine an association between anti-CCP positivity and clinical activity in another study. On the other hand, they found that the IgM RF-positive patients had higher clinical activity [28, 29]. Our study did not determine a significant difference between the DAS-28 score and HRCT findings of RA patients.

In a review article on the pleuro-pulmonary involvement in AS, written by El Maghrauoi and Dehhaoui [30] in 2012, it was emphasized that abnormalities identified on thoracic HRCT images might have been commonly detected without signs of respiratory system disease as well as in early periods of the disease. The common result of all studies conducted to evaluate potential changes in respiratory functions due to reduced thoracic cage mobility was that a restrictive-type respiratory dysfunction was present in AS patients [31-33]. Another significant finding was the FEV1/FVC ratio being normal despite reductions occurring in FVC and FEV1 values [33, 34]. In addition, the mosaic pattern, subpleural nodules, and parenchymal bands are findings that might be detected in early periods of the disease [22, 23]. Even though the incidence of pleuro-pulmonary involvement has been reported within a wide range of 1.3-30%, the most frequently defined and well-known pathology is apical fibrosis [35]. Until recently, plain radiographs and PFT have been used in studies performed to determine pulmonary parenchymal changes. However, using HRCT to evaluate pleuropulmonary involvement has recently become more common in AS patients [36, 37]. It has been suggested that the etiology of the interstitial lung disease identified with HRCT in AS patients was a consequence of the disease's inflammatory process rather than the mechanical effects [38]. In addition to thoracic involvement, the pleuropulmonary involvement, presenting as an extra-articular manifestation, might also be a significant factor for respiratory dysfunctions [6]. In the studies conducted to test this hypothesis, PFT has been performed together with chest x-ray and HRCT for pleuropulmonary involvement in AS patients. It was determined that no association was present between pulmonary functions and pulmonary radiological findings, and PFT was determined to be insensitive in identifying pulmonary interstitial changes. However, HRCT is still recommended in patients with restrictive-type disorders that mechanical factors cannot explain alone [36, 37].

Even though the actual prevalence of pulmonary involvement in RA has not been identified, it has been reported in 1-40% of cases [39]. In RA, pulmonary involvement (9.9%) is the third most common cause of mortality, following infections (23.5%) and cardiovascular disorders (17.3%) [17]. The clinical course is adversely affected mainly by pulmonary fibrosis development. Even though RA is more common in females, pılmonary involvement is more common in males [39]. In numerous studies investigating pulmonary pathologies with HRCT in RA patients, different results have been reported regarding the pathologies' types and prevalences. It has been reported that such differences might have been due to various disease-unrelated factors like smoking, air pollution, and exposure to adverse environmental factors, or disease-related factors like seropositivity, disease duration, drug type, and the duration of its use. Pleural involvement has been determined as the most common type of pulmonary involvement in RA. McDonagh *et al*. reported the interstitial lung disease as the most frequent finding, whereas Cortet *et al*. reported that they most frequently determined bronchiectasis [40, 41]. Regarding the distribution of our RA patients' HRCT findings, the most common lesions were the atelectatic band (18.2%) and fibrosis (15.9%). Regarding the dis-

tribution of chest CT findings, the most common lesions were multiple lymph nodes smaller than 10 mm in size (50.9%), a nodule less than 5 mm in size (32.1%, and the atelectatic band (32.1%).

Even though the pulmonary function test is a valuable method frequently used in clinical practice, it is less sensitive than bronchoscopic and radiographic methods for diagnosing interstitial pulmonary disease in patients with RA. Nevertheless, PFT is an important test for diagnosing pulmonary hypertension and diffuse interstitial lung disease and the response to treatment in rheumatologic disorders, particularly scleroderma [40, 42]. No significant difference was determined between the pulmonary function tests and HRCT findings of RA patients in our study.

Limitations

Our study has various limitations, such as the relatively small patient number, lack of a control group, and being retrospective in nature. These limitations might have led our results to be consistent with or different from the studies published in the literature. Besides, ESR and CRP, which are among nonspecific laboratory parameters affected by many diseases, might be considered factors that could affect the study results. Moreover, clinical, laboratory and radiological features, age, gender, environmental factors, the age of disease onset, harmful habits like smoking, psychological and mental status, socioeconomic level, and drug use being effective on patient assessment might have led to different results compared to other studies. Therefore, we suggest that our study has provided additional information to the literature with these differences.

CONCLUSION

RA, which is one of the most common autoimmune disorders, leads to joint deformities and systemic involvement when diagnosis and treatment are delayed. Therefore, early diagnosis of RA is essential regarding damage prevention. For this reason, specific and sensitive serologic tests are required for early diagnosis. In addition, because pulmonary involvement significantly affects morbidity and mortality in RA, it is necessary to determine pulmonary involvement and arrange the treatment modality in the early period. The pulmonary functions of AS patients are affected due to chest wall restriction and/or primary lung tissue involvement. A restrictive-type pulmonary disorder causing decreased exercise tolerance develops due to reduced chest wall mobility and/or primary lung tissue involvement. Pulmonary involvement in HRCT was more common in RA than AS in our study.

In conclusion, it can be suggested that BASDAI can be used in AS patients in addition to ESR and CRP, which are the most significant indicators of disease activity in clinical practice, whereas ESR, CRP, anti-CCP, and DAS-28 can be used in RA patients. Furthermore, the idea that respiratory dysfunction develops because of thoracic involvement-related mechanical problems rather than pulmonary parenchymal invoılvement occurring during the disease process was supported.

Authors' Contribution

Study Conception: AHT; Study Design: AHT; Supervision: AHT; Funding: AHT; Materials: AHT; Data Collection and/or Processing: AHT; Statistical Analysis and/or Data Interpretation: AHT; Literature Review: AHT; Manuscript Preparation: AHT and Critical Review: AHT.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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