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Original Article

Retrospective evaluation of sarcoidosis cases: 10 years of experience from Turkey

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Abstract

Aim: Clinical features in sarcoidosis are very variable and can present with numerous phenotypes depending on organ involvements, clinical onset (acute, subacute, and chronic) and response to therapy. In this study, we aimed to evaluate the clinical findings, diagnostic methods and treatments of patients with sarcoidosis by 10-years data in our hospital in Turkey.

Materials and Methods: The study was carried out between January 2018 and January 2019. The patients were screened retrospectively from the hospital information system. Clinical details were collected using a structured data collection form.

Results: 172 patients were included in our study. 122 (70.9%) were female and 50 (29.1%) were male. The mean age at diagnosis was 50.18 ± 13.73 years in all patients, while female patients' mean age was 52.86 ± 13.06, male patients' was 43.66 ± 13.24 (p <0.001). Arthralgia were more common in men than in women (30% vs 12.3%) (p:0.008). 70.9% of patients were diagnosed by EBUS-TBNA. Most of the patients were at the stage 1 (49.4%) and stage 2 (41.3%). Extra-pulmonary system involvements were detected in 27.3% of the cases. 27.9% (n:48) of the patients (n:172) did not come back for regular follow-ups. Among those who did do regular follow-ups (n:124), 24.2% showed spontaneous remission, 30.6% showed stable disease, and 45.2% showed remission with treatment.

Conclusion: The general features of the patients were similar to those reported in the literature. In our cases, arthralgia was more common in males. Most significant finding of our study is that the diagnostic method of sarcoidosis seems to have changed after EBUS-TBNA.

Keywords: Arthralgia; EBUS; Sarcoidosis; Serum ACE

INTRODUCTION

Sarcoidosis is a multisystem inflammatory disease characterized by granuloma formation and, in some cases, it causes permanent organ dysfunction. The etiology of sarcoidosis is unknown, but antigen exposure in a genetically susceptible individual under appropriate environmental conditions is thought to cause the development of this disease (1). Sarcoidosis is rare and frequently affects young and middle-aged individuals. The incidence of the disease varies by race, sex, age and geography. However, it can be seen all over the world, in all races and in both sexes (2,3).

The incidence and prevalence of sarcoidosis has been reported to be highest in Scandinavian countries and among African Americans (1,4). The incidence of sarcoidosis is 11.5 / 100.000 in Sweden, 17.8 / 100,000 in African-Americans in the United States, 8.1 / 100.00 for American whites, 4.3 / 100,000 in Latin Americans. In our country, it has been reported as 4 / 100.000 (5-7). In a case-control sarcoidosis study (ACCESS) examining 736 patients at 10 centers in the United States, the disease was found to be more severe in blacks than Caucasians (8).

Sarcoidosis primarily affects the lungs and mediastinal lymph nodes, but may also have extrapulmonary involvement such as eyes, skin, heart and muscle. The course of the disease is variable and can only be asymptomatic when mediastinal lymphadenopathy is present, but severe pulmonary insufficiency may develop when it causes lung fibrosis. Patients with pulmonary involvement often present with dyspnea, dry cough and fatigue. In addition, different symptoms may occur depending on the affected extrapulmonary system, including organ dysfunction in a minority of cases. Apart from the lungs, the most common areas of involvement are skin, eye and liver (2,9,10).

The definitive diagnosis of sarcoidosis is based on appropriate clinical, radiological and pathological findings. However, it is sometimes difficult to diagnose because of the rare occurrence of the disease, the lack of specific and

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sensitive diagnostic methods and different diseases that may lead to similar findings (4). Epidemiological studies have contributed greatly to our knowledge of sarcoidosis by defining the distribution of the disease, examining its long-term consequences, and identifying risk factors for the disease (5,6). In particular, community-based studies provide important information both to determine the etiology of the disease and to predict the prognosis of the disease. The aim of this study is to describe the clinical picture, diagnosis and treatment approach of sarcoidosis cases diagnosed in our hospital in Turkey in the last decade.

MATERIALS and METHODS

2019/68 decision numbered permission was taken from Ankara Yildirim Beyazit University School of Medicine Clinical Researches Ethical Board for our study. The study was conducted between January 2018 and January 2019 at the Pumonary Diseases Clinic of our hospital. One hundred and seventy-two patients followed in the last 10 years were retrospectively scanned from the hospital information system.

Clinical details were collected using a structured data collection form. The demographic data and history of the patients (age, sex, smoking characteristics, history of tuberculosis, history of contact with a person with tuberculosis, comorbidities and familial sarcoidosis history) were recorded. Then, accompanying constitutional, pulmonary and extrapulmonary complaints, physical examination findings, whole blood analysis, routine biochemical analysis, serum angiotensin converting enzyme (ACE) level, 24-hour urine calcium level, tuberculin skin test results, bronchoscopy features of the cases, CD4 / CD8 ratios in bronchoalveolar lavage fluid (BALF), cellular distribution in BALF analysis, bronchial lavage cytology, biopsy results from tissue or lymph node by bronchoscopy, EBUS or other methods, acid-resistant bacillus (ARB) evaluation results, mycobacterial culture results, tuberculosis polymerase chain reaction (TB-PCR) results were recorded. EBUS has been performed in our hospital since 2010. Also, pulmonary function tests, diffusion test, stages of patients according to postero-anterior (PA) chest radiograph (Scadding staging), thorax computed tomography (CT) findings, eye examination results, presence of extrapulmonary involvement, the applied treatments and clinical course were recorded (11,12). Lymph node involvement and lung parenchymal lesions on thorax CT and procedures for the diagnosis and results were recorded.

The diagnosis of sarcoidosis in our clinic is in accordance with the guidelines, accompanied by appropriate clinical, laboratory and radiological findings, in the presence of non-caseified granulomatous reaction with histopathological findings and exclusion of tuberculosis and other etiologies that may cause this condition (12). Only a small number of cases were diagnosed by clinical and radiological findings. In patients who underwent bronchoscopy, ARB examination, TB-PCR examination and mycobacterial culture were performed in bronchial lavage. In patients who underwent tissue biopsy or lymph node aspiration, ARB examination, TB-PCR examination and mycobacterial culture were performed in aspiration material. The patients were grouped according to Scadding staging according to chest radiography; Stage 0: Normal chest X-ray, Stage 1: Bilateral hilar lymphadenopathy (LAP), Stage 2: Bilateral hilar LAP + parenchymal involvement, Stage 3: Parenchymal involvement only, Stage 4: Pulmonary fibrosis (11,12).

Statistical Analysis

SPSS 16.0 package program (Statistical Package for Social Sciences, SPSS Inc., Chicago, IL, United States) was used to evaluate the data. Firstly, the demographic characteristics, presenting symptoms, accompanying symptoms, laboratory findings, diagnostic examination results, clinical and radiological findings were evaluated. Mean ± standard deviation (mean±sd) was given for age. The categorical variables were assessed by frequency and percentage. The median (min- max) values were given for non-normal distribution data. Chi square test was used to compare males and females with respect to the categorical variables. A p-value <0.05 was considered statistically significant.

RESULTS

The demographic characteristics of the patients are given in Table 1. Of 172 patients included in our study, 122 (70.9%) were female and 50 (29.1%) were male. The mean age at diagnosis was 50.18 ± 13.73 years in all patients, 52.86 ± 13.06 in women patients, 43.66 ± 13.24 in men patients and there was a statistically significant difference between the genders (p <0.001). Only 2 patients (1.2%) had tuberculosis history and 7 (4.1%) patients had a history of contact with a tuberculosis patient. When comorbidities were evaluated; cardiovascular disease in 28 (16.3%), chronic lung diseases (asthma, COPD, bronchiectasis) in 15 (8.7%), diabetes mellitus in 13 (7.6%), thyroid disease in 9 (5.2%), collagen tissue diseases in 8 (4.6%), chronic renal diseases in 5 (2.9%), neurological diseases in 5 (2.9%), psychiatric diseases in 4 (2.3%), psoriasis in 2 (1.2%) and malignancies in 2 (1.2%) patients were detected. None of the patients had a history of family sarcoidosis.

Pulmonary and extrapulmonary complaints were questioned (Table 1). All symptoms were similar in both genders except for the arthralgia. The arthralgia was more common in men than in women (30% vs 12.3%) and there was a statistically significant difference between the two genders (p = 0.007). Pulmonary examination findings included rhonchi (5.8%) and fine crackle (5.2%). Other systemic examinations included peripheral palpable LAP (2.9%), swelling of the parotid gland (2.3%), hepatomegaly (1.2%), splenomegaly (1.2%), and cyanosis (0.6%). Routine laboratory examinations were performed at the first admission of the cases. In some cases, leukopenia (0.6%), leukocytosis (5.2%), anemia (12.2%), polycythemia (3.5%), thrombocytopenia (1.2%), thrombocytosis (4.1%), hyperglycemia (23.8%), hyperuricemia (16.9%), creatinine

elevation (9.9%), AST elevation (10.5%), ALT elevation (20.5%), hyponatremia (1.2%), hypoalbuminemia (4.7%), hypercalcemia and/or hypercalciuria (3.5%) were detected. The median CRP level was 3,7 mg / L (min-max: 0-142), and the median serum ACE level was 67 U / L (min-max: 10-696). Tuberculin skin test was applied to 89 cases and 60 (34.9%) of them were negative and 29 (16.9%) were positive.

Diagnostic methods of the patients are shown in Table 2. Endobronchial ultrasound guided transbronchial needle aspiration (EBUS-TBNA) was applied to 122 (70.9%) cases and reported as non-caseified granulomatous reaction supporting sarcoidosis. In the same time period (2009 January-2019 January), EBUS examination records revealed that 122 of 163 patients who underwent EBUS for mediastinal LAP were diagnosed as sarcoidosis. Other patients were diagnosed as lymphoma, tuberculosis and other benign pathologies. Sarcoidosis was excluded in these patients. The rate of sarcoidosis in our patients diagnosed with EBUS was 70.9%. Other diagnostic methods were shown in Table 2. TB-PCR examination was evaluated in bronchial lavage in 152 (82.4%) cases, ARB examination was performed in 151 (87.8%) cases and all results were found negative. Mycobacterial culture was performed in 149 (86.6%) cases and there was no growth. Cellular distribution in BALF analysis showed that macrophages were 45,35± 20,15%, neutrophils were 19,32 ± 24,02%, lymphocytes were 30,50 ± 17,56%, eosinophils were 2,43 ± 1,59%, the ratios of CD4/CD8 were 4,98 ± 3,12.

After the diagnosis of sarcoidosis, pulmonary function tests were performed to evaluate the functional status of the lungs. Forced vital capacity (FVC) 80.50 ± 14.72%, forced expiratory volume in the first second (FEV1) 74.95 ± 12.91%, FEV1 / FVC 79.85 ± 9.83, diffusion capacity (DLCO) 79.09 ± 12.81 %, the ratio of diffusion capacity to alveolar ventilation (DLCO / VA) was 76.00 ± 19.74 %. Stages of cases with sarcoidosis, thorax CT findings, the frequencies of extrapulmonary involvements and systemic treatment indications were given in Table 2. Recurrence was observed in 15 cases (8.7%) after treatment. Recurrence localizations were lungs in 5 (2.9%) patients, skin in 7 (4.1%) patients, salivary gland in 1 (0.6%) and eye involvement occurred in 1 (0.6%) patient. Frequencies of the therapies applied to patients according to the indication were non-steroidal anti-inflammatory treatment (2.3%), systemic corticosteroid (CS) (29.1%), methotrexate (6.4), hydroxychloroquine (1.2%), leflunomide (0.6%) and tumor necrosis factor (TNF) alpha blocker (0.6%).

Total follow-up period was 3.20 ± 2.30 years (min-max: 1-10 years). 116/172 patients (67.4%) were planned to follow up without treatment. But, 27.9% (n:48) of the patients (n:172) did not come back for regular follow-ups. Among those who did do regular follow-ups (n:124), 24.2% (n:30) showed spontaneous remission, 30.6% (n:38) showed stable disease, and 45.2% (n:56) showed remission with treatment. The clinical courses of the patients according to stages were shown in Table 3.

Table 1. The characteristics of the sarcoidosis patients

	Total (n:172)	Female (n:122)	Male (n:50)	p
Age (mean ± SD)	50.18 ± 13.73	52.86 ± 13.06	43.66 ± 13.24	**<0.001**
Age distribution, n (%)				
19-29	10 (5.8)	4 (3.3)	6 (12)	
30-39	33 (19.2)	17 (13.9)	16 (32)	**<0.001**
40-49	37 (21.5)	23 (18.9)	14 (28)	
50-59	46 (26.7)	38 (31.1)	8 (16)	
>60	46 (26.7)	40 (32.8)	6 (12)	
Smoking history, n (%)				
Smoker	23 (13.4)	9 (7.4)	14 (28)	**0.001**
Ex-smoker	23 (13.4)	15 (12.3)	8 (16)	
Non-smoker	126 (73.3)	98 (80.3)	28 (56)	
Symptoms, n (%)				
Cough	74 (43)	55 (45.1)	19 (38)	0.403
Dyspnea	62 (36)	47 (38.5)	15 (30)	0.476
Arthralgia	30 (17.4)	15 (12.3)	15 (30)	**0.007**
Sputum production	29 (16.9)	21 (17.2)	8 (16)	0.511
Erythema nodosum	28 (16.3)	18 (14.8)	10 (20)	0.283
Chest pain	25 (14.5)	20 (16.4)	5 (10)	0.357
Skin lesion	23 (13.4)	13 (10.7)	10 (20)	0.106
Fatigue	22 (12.8)	12 (9.8)	10 (20)	0.076
Fever	13 (7.6)	6 (4.9)	7 (14)	0.051
Night sweating	10 (5.8)	7 (5.7)	3 (6)	0.311
Arthritis	10 (5.8)	5 (4.1)	5 (10)	0.172
Weight loss	9 (5.2)	5 (4.1)	4 (8)	0.214
Hemoptysis	1 (0.6)	1 (0.8)	0 (0)	0.482

Table 2. The clinical features of the sarcoidosis patients

Characteristics	n	%
Methods of diagnosis		
EBUS-TBNA	122	70.9
Clinical and radiological	11	6.4
Skin biopsy	8	4.7
Bronchial mucosal biopsy	6	3.5
TBNA (Wang method)	6	3.5
TBLB	5	2.9
Peripheral LAP biopsy	5	2.9
Mediastinoscopy	4	2.3
Salivary gland biopsy	3	1.7
Liver biopsy	2	1.2
Stages		
Stage 0	12	7
Stage 1	85	49.4
Stage 2	71	41.3
Stage 3	1	0.6
Stage 4	3	1.7
Thorax CT findings		
Bilateral hilar LAP	123	71.5
Paratracheal LAP	113	65.7
Reticular infiltration	39	22.7
Ground-glass appearance	38	22.1
Nodular pattern	33	19.2
Bronchiectasis	7	4.1
Minimally fibrotic changes	7	4.1
Right hilar LAP	4	2.3
Left hilar LAP	3	1.7
Honey combing	3	1.7
Pleural fluid	1	0.6
Serum ACE level		
Normal	54	31,4
Increased	118	68
Frequency of extrapulmonary sarcoidosis		
Skin	15	8.7
Arthritis	12	7
Peripheral LAP	10	5.8
Eye	9	5.2
Salivary gland	5	2.9
Heart	4	2.3
Neurosarcoidosis	4	2.3
Liver	2	1.2
Stomach	1	0.6
Total	62	36
Systemic treatment indications		
Lung involvement	24	14
Arthritis	8	4.7
Hypercalcemia / hypercalciuria	6	3.5
Skin involvement	5	2.9
Cardiac involvement	4	2.3
Neurosarcoidosis	3	1.7
Eye involvement	3	1.7
Liver involvement	1	0.6
Erythema nodosum	1	0.6
Cardiac involvement + neurosarcoidosis	1	0.6

EBUS-TBNA: Endobronchial ultrasound guided transbronchial needle aspiration; TBNA:Transbronchial needle aspiration; TBLB:Transbronchial lung biopsy; LAP:Lymphadenopathy; CT:Computed tomography; ACE:Angiotensin converting enzyme

Table 3. The clinical courses of the patients according to stages

Total (n:172)	Stages	n	%
Without treatment (n:116)			
Spontaneus remission (n:30)	Stage 0	1	3.3
	Stage 1	14	46.7
	Stage 2	15	50
	Stage 3	0	0
	Stage 4	0	0
Stable diseases (n:38)	Stage 0	3	7.9
	Stage 1	18	47.4
	Stage 2	16	42.1
	Stage 3	0	0
	Stage 4	1	2.6
Could not be followed(n:48)	Stage 0	2	4.2
	Stage 1	29	60.4
	Stage 2	17	35.4
	Stage 3	0	0
	Stage 4	0	0
Remission with treatment (n:56)	Stage 0	6	10.7
	Stage 1	24	42.9
	Stage 2	23	41.1
	Stage 3	1	1.8
	Stage 4	2	3.6

DISCUSSION

In our study, we evaluated our sarcoidosis patients who were followed up for 10 years. Of the patients, 29.1% were male and 70.9% were female and the female / male ratio was found as 2.44 / 1. The mean age in our cases, was 50 years, 53 in women, and 44 in men accordance with the literature. The occurrence of sarcoidosis varies greatly according to age and sex. In a previously reported study from our country, the female / male ratio was found as 1.83-2.08 / 1 (7,13). In the ACCES study, female/male ratio was found as 1.77 (16). The general mean age of onset is between 47 and 51 years. In some populations, there is a 10-year difference between men and women at the age at which they are diagnosed (5,14,15). Sarcoidosis was seen less frequently in smokers. In the ACCESS study, sarcoidosis was found to be 35% less in smokers (16). Also, similar results have been shown in other studies conducted in our country (7,13). The majority of our cases (73.3%) were non-smokers and female patients were significantly less smokers than men. An epidemiological study which related sarcoidosis in our country showed familial sarcoidosis quite rare (1/100.000) (7-9). In our study, there was no familial sarcoidosis or familial interstitial lung diseases.

Signs and symptoms of pulmonary sarcoidosis include dry cough, exertional dyspnea, chest tightness, wheezing, hypoxemia and decreased lung functions (2,9,17). In our cases, the most common pulmonary complaint was cough. This result was similar to both our country data and other country data (7). This was followed by dyspnea, sputum production, chest pain and hemoptysis. More than 90% of patients present with mediastinal, pulmonary, skin or ocular sarcoidosis and 30-50% with extrapulmonary disease (18). In our cases, arthralgia

was the most common extrapulmonary symptom. This was followed by erythema nodosum, skin lesion and fatigue. Fever, night sweating and weight loss were less frequent. Earlier studies in Spain and Estonia showed more musculoskeletal symptoms in women than in men (19,20). In our study, when the symptoms were evaluated according to gender, only arthralgia symptoms were significantly higher in males.

Hypercalcemia/hypercalciuria was found low in our cases (3.5%). The low rates for hypercalcemia also have been reported (3-6.6%) in previous publications from Turkey (13, 21). The incidence of Lofgren's syndrome (LS) syndrome varies significantly between populations (0.7-50%) (22). In our study, LS was defined in only 9 (5.2%) cases. Erythema nodosum was reported as 8.3% in the ACCESS study, whereas it was 16.3% in our cases (8).

Diagnosis of sarcoidosis requires the presence of characteristic non-caseified granulomas in the presence of appropriate clinical, laboratory and radiological findings (23). In our study, 6.4% of patients diagnosed based on clinical, laboratory and radiological findings. To confirm the pathological diagnosis of sarcoidosis various bronchoscopic methods such as mucosal biopsy, TBNA or transbronchial lung biopsy (TBLB) have been used. However, the use of combined TBLB and mucosa biopsy has provided a diagnosis of sarcoidosis only in two thirds of the cases (24). Today, EBUS-TBNA is a valuable and feasible method which has high diagnostic yield for diagnosis of mediastinal and hilar LAPs. Our sarcoidosis cases were mostly diagnosed by EBUS-TBNA (in 122 cases,70.9%) and the cases were mostly in stage 1 and stage 2. Excellent diagnosis of the lymphadenopathies with EBUS decreased the rate of mediastinoscopy. The diagnostic rate of the EBUS-TBNA for early stages of sarcoidosis (stage 1 and 2) is quiet higher than conventional techniques (25-28). In addition, the bronchial mucosa is another site affected by granulomas. Endobronchial sarcoidosis is characterized by waxy yellow mucosal nodules with a diameter of 2-4 mm. Studies have shown that granulomas are observed in 54-90% of biopsies when mucosal abnormalities are seen macroscopically (25,29). In the bronchoscopic evaluation of our cases, millimetric nodules were observed in the mucosa of 11 cases and mucosal biopsy results were consistent with non-caseified granulomatous reaction in 6 (54.5%) cases. In lung involvement, there is typically an increased CD4 / CD8 lymphocyte ratio in BALF. In a meta-analysis, the sensitivity and specificity were reported as 70-83% (30). In our cases, increased CD4 / CD8 lymphocyte ratio was observed (4.98 ± 3.12).

In the evaluation of pulmonary function tests, restrictive type respiratory disorder, forced vital capacity and forced expiratory volume decreased by nearly more than half of the patients with airflow restriction (17). Some of our patients had mild impairment in pulmonary function tests. Regardless of the prevalence of tuberculosis in sarcoidosis, an anergic response to the tuberculin skin test is expected and the negative result supports sarcoidosis. In our study, two-thirds of the patients who underwent tuberculin skin test had negative results. Also, 2 patients (1.2%) had tuberculosis history and 7 (4.1%) patients had a history of contact with a tuberculosis patient. But, tuberculosis examinations were negative in these cases.

Scadding staging system provides prognostic information about the progression of lung disease (11). The cases reported from Japan had more stage 1 disease, whereas Europeans and Americans had more advanced radiographic stages (31,32). Our cases were mostly in stage 1 and in stage 2. CT is more sensitive in detecting mild parenchymal changes that are not clearly seen in chest X-ray. In addition, before EBUS-TBNA, contrast-enhanced CT is usually required. Finally, a baseline CT scan allows comparison during the course of the disease. CT findings of sarcoidosis include; normal pulmonary parenchyma or reticulonodular pattern, interseptal thickening, ground-glass appearance, fibrosis, bronchiectasis, honeycombing and adenopathies (33). In our cases, bilateral hilar LAP, paratracheal LAP, reticular infiltration, ground glass and nodular pattern were found to be the most frequent.

Various biological abnormalities can be found in patients with sarcoidosis associated with granulomatous physiopathology or specific organ involvement. Granulomas are responsible for high serum ACE, hypercalciuria and hypercalcemia. The sensitivity of serum ACE in the diagnosis of sarcoidosis varied widely from 41% to 100% in various sarcoidosis groups, with specificity ranging from 83% to 99% (34). Also in our cases, serum ACE levels showed a wide variation (10-696 U / L) and were found high in two thirds of the cases.

There is no definitive treatment for sarcoidosis and treatment only changes the granulomatous process and clinical outcomes (18). Side effects of some drugs may affect the patient more than the mild form of the disease. Systemic corticosteroids (CS) are still the first standard treatment of choice (4). More than half of our patients did not receive treatment (67.4%). Most of the treated patients received systemic CS therapy.

In the study, 36% of the patients had extrapulmonary involvement, most common extrapulmonary involvements being skin involvement, arthritis, peripheral LAP and eye involvement. Only 4 cases were diagnosed with cardiac sarcoidosis. In the diagnosis of extrapulmonary sarcoidosis, CT, magnetic resonance imaging (MRI) and FDG-PET are useful (33). Cardiac involvement of sarcoidosis is an important factor in the evaluation of prognosis. While its clinical prevalence is 5%, it increases to 20-25% in autopsy studies (17,35). Today, non-invasive methods cardiac MRI or FDG-PET are used for diagnosis (36). All patients with cardiac involvement were diagnosed with cardiac MRI and all of them were treated with systemic CS. Also, neurosarcoidosis was detected in 4 cases. Concurrent cardiac involvement was also observed in one of these cases. Systemic CS therapy was used for their treatment. Neurosarcoidosis can be life-threatening and approximately 5-10% of sarcoidosis patients have neurological involvement. MRI is the first choice for imaging intracranial lesions (37).

The mortality rate from pulmonary sarcoidosis was 5.5 in 100,000 in 2014 (38). Sarcoidosis has mostly good prognosis. While half of the patients recovered spontaneously within 2 years, many patients recovered within 5 years (18). Refractory sarcoidosis refers to patients who progress despite treatment. Prognosis in sarcoidosis depends mainly on the mode of onset, individual factors, initial clinical course and degree of disease (39). Approximately 20% of patients with pulmonary sarcoidosis develop pulmonary fibrosis (stage 4 sarcoidosis) (2). Due to the lack of regular follow-ups of 48 patients, the results of the clinical course of all patients could not be given in our study. Since our hospital is located in the capital and many other patients come to our center from other provinces, some patients left our long-term follow-up because of they wanted to continue their treatments in the provinces they lived. The rest of the cases who had regular follow up showed a good course. There was progression in only 3 (1.7%) patients with lung involvement to stage 4. The clinical course of patients with cardiac involvement and neurosarcoidosis had a good prognosis and responded to the given treatments (40). In our follow-up, there were no exitus and no cases of progressive fibrosis except minimal fibrotic changes on thorax CT.

CONCLUSION

There were several limiting conditions due to the retrospective nature of our study. It is expected that there will be deficiencies in the evaluation and recording of clinical findings. In addition, some of the diagnosed cases were living in other cities and had follow-ups in other centers. The general characteristics of our cases were similar to those reported in the literature. But, arthralgia was more common in males, especially in contrast to those previously reported. Most significant finding of our study is that the diagnostic method of sarcoidosis seems to have changed after EBUS-TBNA. It is also clearly noticeable that biopsies taken from lymph nodes by EBUS guided bronchoscopy enhanced the cytopathological diagnosis of sarcoidosis.

Competing Interests: The authors declare that they have no competing interest.

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