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Elderly-onset pulmonary sarcoidosis: A radiological approach to diagnosis

Sevtap Doğan[1], Onural Öztürk[2], Sevil Aydoğan Diş[3], Serap Argun Barış[4], Nurettin Özgür Doğan[5]

[1] Department of Radiology, Kocaeli University, Kocaeli, Turkey; [2] Department of Radiology, Kocaeli University, Kocaeli, Turkey; [3] Department of Pulmonology, Kocaeli University, Kocaeli, Turkey; [4] Department of Pulmonology, Kocaeli University, Kocaeli, Turkey; [5] Department of Emergency Medicine, Kocaeli University, Kocaeli, Turkey

Abstract. *Background and aim:* The aim was to compare the radiological and clinical characteristics of sarcoidosis between elderly and non-elderly patients. *Methods:* This retrospective observational study was carried out in patients with sarcoidosis. Elderly-onset sarcoidosis was defined as sarcoidosis diagnosed in patients ≥65 years-old. Patients were stratified by age (≥65 years versus <65 years) and radiological and clinical data were compared between age groups. *Results:* Of the 163 patients, 38 (23.3%) were in the elderly group and 125 (76.7%) were in the non-elderly group. Elderly patients more frequently demonstrated arthralgia (50% vs. 12.8%, p<0.001), coronary artery disease (15.8% vs. 2.4%, p=0.005), congestive heart failure (13.2% vs. 0.8%, p=0.003), pneumonia (7.9% vs. 0.8%, p=0.04), and pleural fluid (18.4% vs. 0.0%, p<0.001). Clinical remission was significantly more likely in younger patients than in the elderly (76.8% vs. 55.3%, p=0.01). The clinical course to chronic-progressive disease was similar in both groups (p=0.635). Radiologically, lymph nodes measuring 10-25 mm in the short axis (89.5% vs. 72.6%, p=0.032), usual interstitial pneumonia pattern (10.5% vs. 0.8%, p=0.011), and main pulmonary artery diameter above 30 mm (34.2% vs. 16.0%, p=0.014) were significantly more frequent in the elderly group. Elderly patients tended to demonstrate Scadding stage I and II sarcoidosis (39.5% and 31.6%). *Conclusions*: Presentation of elderly-onset sarcoidosis appears to differ from young-onset sarcoidosis. Radiologically, lymph node enlargement and the pattern of fibrosis may be distinctive.

Key words: sarcoidosis, geriatric assessment, radiology, fibrosis, multidetector computed tomography

Introduction

Sarcoidosis is a chronic granulomatous disease that can affect multiple organ systems in those with a predisposition to developing sarcoidosis and presumed exposure to an environmental trigger (1). The clinical manifestations of sarcoidosis are diverse and can range from asymptomatic to severe organ dysfunction. Diagnosis is made by appropriate clinical-radiological presentation, differentiation of non-caseating granuloma, and exclusion of other granulomatous diseases (1-3).

Sarcoidosis can appear in patients of any age but it is most commonly diagnosed between the ages of 20 and 30 years. A second peak is described in women around the age of 50 (3, 4). Although it is unlikely to be diagnosed at an advanced age, there are studies suggesting an increasing trend in the diagnosis of elderly-onset sarcoidosis (EOS) with an incidence of 7-15% (5-10). The aging process may affect the clinical presentation and radiological findings of sarcoidosis. Furthermore, the natural course of sarcoidosis may differ in the elderly population due to immunosenescence and age-related changes in the immune system.

Correspondence:
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Nurettin Özgür Doğan, MD, Professor
Kocaeli University, Faculty of Medicine,
Dept. of Emergency medicine
Kocaeli, 41001 Turkey
E-mail: nurettinozgurdogan@gmail.com

Radiological imaging is an essential tool in the diagnosis and monitoring of sarcoidosis. Pulmonary involvement, with lymph node enlargement and parenchymal disease, is the prominent presentation, and radiological diagnosis is important to prevent delays in definitive diagnosis (1). Chest radiography (CXR) and computed tomography (CT) are the most commonly used imaging modalities in the evaluation of pulmonary sarcoidosis.

Scadding classified pulmonary sarcoidosis on CXR and, over six decades later, this system is still used to classify patients with sarcoidosis, in part because of its simplicity (11). Chest radiography is often the first-line imaging method used in the diagnosis. Computed tomography is more sensitive for the detection of subtle parenchymal disease, or minimal fibrosis and can be recommended to a selected patient population (12).

In this study, we aimed to evaluate the radiological findings of EOS, together with clinical manifestations, and compare them with earlier onset sarcoidosis imaging and clinical findings. The results may provide valuable information on radiological characteristics in the elderly population that may help in the diagnosis and management of this particular group.

Methods

Study design and participants

This single-center, retrospective observational study was carried out in patients with sarcoidosis diagnosis between 2009 and 2022 in a tertiary-care university hospital. This study was performed in accordance with the tenets of the Declaration of Helsinki, and Institutional Review Board approval was obtained before the study started.

Study protocol

Patients over the age of 18 years, being followed up in a single center with the diagnosis of sarcoidosis, and with at least one CT imaging were included in the study. Patients whose information could not be accessed or who had insufficient data were excluded. Patients diagnosed with malignancy and other granulomatous diseases were also excluded. Patients with sarcoidosis were divided into two groups according to the age at which they were first diagnosed, and patients aged 65 and over at diagnosis were designated the elderly onset sarcoidosis group (EOS). Clinical outcomes were classified as remission (disappearance of symptoms and radiological findings) or progressive-chronic disease (symptomatic or persistent disease of more than 5 years).

Sarcoidosis patients were diagnosed according to the ATS/ERS/WASOG criteria (3). Baseline demographic characteristics, comorbidities, laboratory data, pulmonary function tests, extra-pulmonary organ and lymph node involvement, smoking status, and clinical course of the patients were obtained through the hospital data system by investigating ICD codes and from the archive of the pulmonology department. The CT images of the patients were obtained through the hospital PACS system. Extra-pulmonary organ involvement was defined according to the previously reported criteria by Judson et al (13).

CT technique and interpretation

Chest CT examinations were performed with a 64-detector scanner (Aquillion 64; Canon Medical Systems, Otawara, Tochigi, Japan - previously Toshiba Medical Systems) in a supine position with full inspiration. Scanning parameters were: voltage, 120 kV; current, variable mAs according to the patient size using an automatic exposure control system; slice thickness, 1 mm; and reconstruction interval, 5.0 mm. The images were reconstructed in a 512 × 512 matrix by applying a standard, high-resolution CT reconstruction algorithm. All images were viewed with a window level of –600 and a width of 1.600 Hounsfield units. Images were reconstructed with a lung parenchyma FC52 kernel and a mediastinal FC13 kernel. No iterative reconstruction techniques were applied. The CT images were interpreted independently by two thoracic radiologists, one with 16 and the other with 3 years of experience in thoracic radiology.

Chest CT images were evaluated using Scadding's classification system at the time of the initial diagnosis and in follow-up CT, when available (11). Scadding classified CXR findings in sarcoidosis into five stages: Stage 0 (normal); stage I (hilar or mediastinal nodal enlargement only); stage II (nodal enlargement and parenchymal disease); stage III (parenchymal disease only); stage IV (end-stage lung disease -pulmonary fibrosis).

Lymphadenopathy and parenchymal nodules were evaluated in terms of distribution and size. Well-defined, mediastinal lymph node enlargement and bilateral, symmetric hilar lymph node enlargement, with or without calcifications, was noted as typical for sarcoidosis (12). Lymphadenopathy with necrotic appearance, asymmetric involvement, such as an isolated, unilateral hilar involvement or mediastinal lymph node enlargement without hilar lymphadenopathy, were considered atypical. Lymph node enlargement was divided into two groups according to the short diameter measurements, accepting 25 mm as the cut-off value.

Multiple, bilateral, perilymphatic, and symmetrically distributed micronodules (1-4 mm) predominantly involving the upper and middle zones were considered typical (12). Centrilobular or random distribution and predominance of lower lobe involvement of micronodules were considered atypical (14). Large nodules or masses (1 to 4 cm in diameter) and cavitary nodules were also noted.

Other radiological findings, such as ground-glass opacities (GGOs), consolidations, linear opacities, sarcoid galaxy sign, the main pulmonary artery diameter (MPAD), and the ratio of the diameter of the main pulmonary artery to the diameter of the ascending aorta (MPAD/AAD) were also noted. Cut-off values were determined as 30 mm for the MPAD and 1 for the MPAD/AAD. The basic CT terminology for elementary lesions was used, as described by the Fleischner Society Glossary (15).

Irreversible findings, such as architectural distortion, traction bronchiectasis, "honeycombing", and fibrotic masses were accepted as sarcoidosis with pulmonary fibrosis (stage IV). Pulmonary fibrosis with usual interstitial pneumonia (UIP) pattern with diffuse or lower-lobe-dominated reticulation, traction bronchiectasis, and honeycombing was also noted.

The radiological change between the initial and follow-up CT scans was classified as stable/regression or progression. An increase in the size of lymph nodes or parenchymal nodular-infiltrative lesions, development of end-stage disease, and increase in interstitial findings were considered radiological progression.

Statistical analysis

All statistical analyses were performed with the Jamovi program (The Jamovi Project, 2021, ver. 1.6, retrieved from https://www.jamovi.org). Continuous variables were compared using the Mann-Whitney U test and are presented as median and interquartile ranges (IQRs). Categorical variables were compared with the chi-square test and are presented as counts and percentages. All the statistical analyses were two-sided and an alpha value of 0.05 was considered to be the nominal level of significance.

Results

Baseline characteristics

The medical records of 211 consecutive patients diagnosed with sarcoidosis were reviewed. After the exclusion criteria were implemented, 163 patients were included on the dates determined for the study (Figure 1). While 38 of these patients were in the EOS population (23.3%), 125 were in the non-elderly group (76.7%). The median age of all 163 patients was 53 (IQR: 32 to 62) years. The highest age was 81 years in the EOS patient group. The diagnosis of granulomatous inflammation was based on a biopsy in 15 (39.4%) patients in the elderly group and 36 (28.8%) patients in the non-elderly group.

Table 1 shows the characteristics of the study population in terms of age, gender, smoking status, comorbidities, clinical-laboratory data, and clinical course. There was no significant difference between the genders in either group and the proportion of female patients was higher. In terms of comorbidities, coronary artery disease, and congestive heart failure were found to be significantly more common in the EOS group (p=0.005 and p=0.003, respectively). Regarding clinical characteristics, arthralgia was significantly more likely in the EOS group, while other findings were similar in both groups. Laboratory findings were similar in both groups.

The median clinical follow-up time after diagnosis of sarcoidosis was 6 (IQR: 4 to 8) years and this time interval was similar between EOS and non-elderly patients (p=0.398). When the clinical prognosis was compared between the two groups, a significant difference was observed in remission rates, while the rates of chronic-progressive disease did not show a significant difference (p=0.010 and p=0.635, respectively). A total of 16 patients (9 in the elderly and 7 in the non-elderly group) did not comply with the clinical follow-up process for various reasons and clinical data could not be obtained.

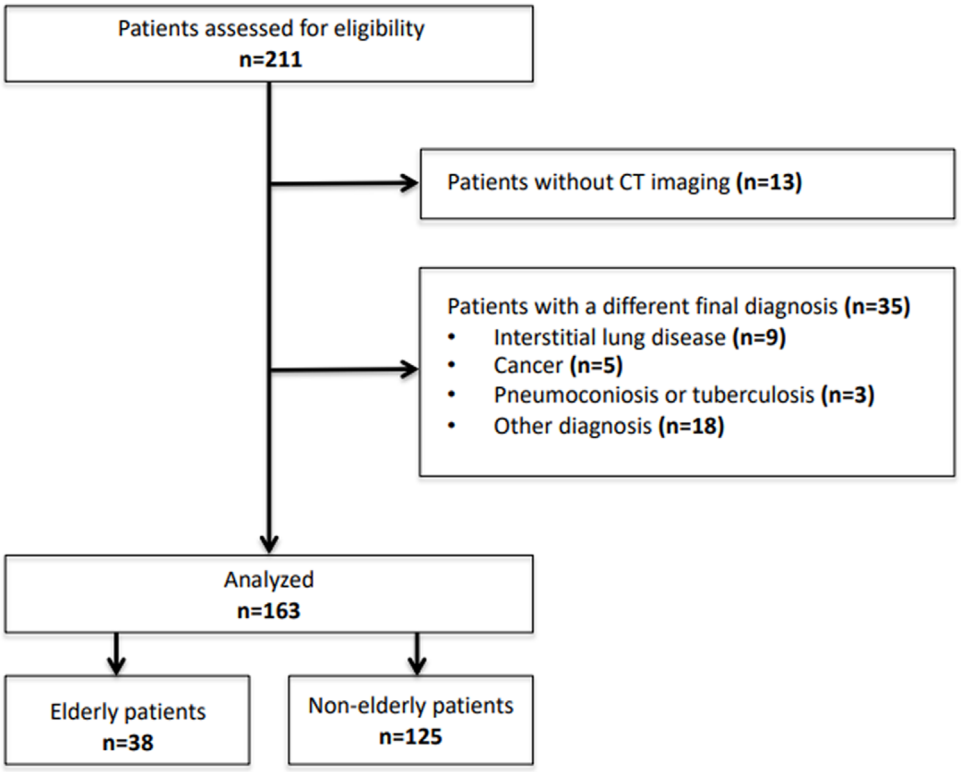

Figure 1. Patient flow-chart.

However, we performed a sensitivity analysis to understand the effect of lost patients on patient outcomes. Accordingly, in the modeling performed with the assumption that all patients who disappeared during follow-up had a poor outcome, it was observed that 29 patients (23.2%) in the non-elderly group had a better outcome than 17 patients (44.7%) in the elderly group (relative risk: 0.52, 95% CI: 0.32 to 0.84, p=0.010).

Radiological assessment

The radiological findings of the patients are presented in Table 2. Scadding stages on initial CT according to age groups are presented in Table 3. Typical lymph node enlargement and typical parenchymal micronodules were common in both groups. While lymph nodes measuring between 10-25 mm in short diameter were significantly more frequent in the EOS group, no difference was found in the incidence of lymphadenopathy above 25 mm (p=0.032 and p=0.146, respectively). The galaxy sarcoid sign was never observed in the EOS patient group.

MPAD measurements were found to be significantly larger in the EOS patient group (p=0.014). The MPAD/AAD ratio did not differ significantly between the groups. Pleural fluid and pneumonia were found to be significantly more likely in the EOS patient group (p<0.001, p=0.04, respectively).

A total of 131 patients had follow-up tomography in the study group (31 elderly patients, 100 non-elderly patients). The median time interval between initial and follow-up CT imaging was 24 (IQR: 12 to 36) months in the EOS group and 36 (IQR: 18 to 72) months in the non-elderly group (p=0.012). In all elderly patients with radiological progression, the clinical course was also chronic-progressive. In the non-elderly patients, out of 25 patients with radiological progression, the clinical course was progressive-chronic in 15 patients and stable in 10 patients.

The number of patients with pulmonary fibrosis (stage IV disease) on initial CT did not differ significantly between groups (p=0.15). The frequency of the UIP pattern, predominantly peripheral and often in the mid-lower zones, was found to be significantly more common in the EOS group (p=0.011).

Table 1. Baseline characteristics of the study population.

	All patients (n=163)	Elderly (n=38)	Non-elderly (n=125)	p value
Age, median (IQR)	53 (32 to 62)	68 (65 to 81)	35 (29 to 64)	***<0.001***
Female gender, n (%)	118 (72.4%)	27 (71.1%)	91 (72.8%)	0.833
Smoking, n (%)	39 (23.9%)	14 (36.8%)	25 (20.0%)	***0.033***
Comorbidities				
Diabetes mellitus, n (%)	25 (15.3%)	5 (13.2%)	20 (16.0%)	0.670
Hypertension, n (%)	58 (35.6%)	18 (47.4%)	40 (32.0%)	0.083
Coronary artery disease, n (%)	9 (5.5%)	6 (15.8%)	3 (2.4%)	***0.005***
Congestive heart failure, n (%)	6 (3.7%)	5 (13.2%)	1 (0.8%)	***0.003***
Chronic kidney disease, n (%)	4 (2.5%)	2 (5.3%)	2 (1.6%)	0.232
Clinical characteristics				
Cough, n (%)	58 (35.6%)	9 (23.7%)	49 (39.2%)	0.080
Dyspnea, n (%)	67 (41.1%)	16 (42.1%)	51 (40.8%)	0.886
Chest pain, n (%)	23 (14.1%)	7 (18.4%)	16 (12.8%)	0.383
Erythema nodosum, n (%)	18(11.5%)	3(7.9%)	15 (12.0%)	0.570
Arthralgia, n (%)	35 (21.5%)	19 (50.0%)	16 (12.8%)	***<0.001***
Uveitis, n (%)	8 (4.9%)	2 (5.3%)	6 (4.8%)	1.000
Extrapulmonary lymph node, n (%)	7 (4.3%)	0 (0.0%)	7 (5.6%)	0.202
Laboratory characteristics				
Leucocyte count (cells x 10^3/μL)	6.8 (5.7-8.6)	7.5 (6.2-9.2)	6.7 (5.5-8.3)	0.102
Platelet count (cells x 10^3/μL)	251 (213-292)	238 (187-284)	253 (214-292)	0.223
CRP, mg/dL, median (IQR)	1.8 (0.5-4.2)	1.9 (0.4-4.2)	1.7 (0.5-4.2)	0.779
Clinical course				
Follow-up, years, median (IQR)	6 (4 to 8)	6 (3 to 8)	6 (4 to 8)	0.398
Remission, n (%)	117 (71.8%)	21 (55.3%)	96 (76.8%)	***0.010***
Progression, n (%)	26 (16%)	7 (18.4%)	19 (15.2%)	0.635
Mortality, n (%)	4 (2.5%)	1 (2.6%)	3 (2.4%)	1.000

Abbreviations: IQR: Interquartile range; CRP: C-reactive protein.

Discussion

The aim of this study was to explore the differences in clinical and radiological features between patients diagnosed with sarcoidosis at younger and older (≥65 years) ages. Our findings suggest that there are significant differences between these two groups, particularly in terms of radiological presentation. Patients diagnosed with sarcoidosis at old ages were found to have a higher prevalence of atypical radiological findings, whereas younger patients exhibited a greater incidence of radiological and clinical remission. There are a limited number of papers on EOS in the literature, however most of them primarily focus on clinical and laboratory data. The present study is the first to focus on and detail the radiological findings by correlating them with clinical data in EOS patients.

There are many studies in the literature showing that there are no significant markers in clinical, laboratory, and pulmonary function tests in EOS patients (10, 16-19). An indolent decline in general health, fatigue, loss of appetite, and weight loss are common features in the presentation of EOS (9, 17, 20). In the present study, while uveitis was more common in the EOS group, erythema nodosum was less common.

Table 2. Radiological characteristics of the study population on initial CT.

	All patients (n=163)	Elderly (n=38)	Non-elderly (n=125)	p value
GGO, n (%)	24 (14.7%)	5 (13.2%)	19 (15.2%)	0.756
Linear opacities, n (%)	52 (31.9%)	13 (34.2%)	39 (31.2%)	0.727
Architectural Distortion, n (%)	10 (6.1%)	3 (7.9%)	7 (5.6%)	0.606
Conglomerate mass, n (%)	8 (4.9%)	2 (5.3%)	6 (4.8%)	0.908
UIP Pattern, n (%)	5 (3.1%)	4 (10.5%)	1 (0.8%)	***0.011***
Sarcoid galaxy sign, n (%)	12 (7.4%)	0 (0.0%)	12 (9.6%)	0.070
Pneumonia, n (%)	4 (2.5%)	3 (7.9%)	1 (0.8%)	***0.040***
Edema, n (%)	2 (1.2%)	2 (5.3%)	0 (0.0%)	0.053
Free fluid, n (%)	7 (4.3%)	7 (18.4%)	0 (0.0%)	***<0.001***
Pulmonary Fibrosis, n (%)	12 (7.4%)	5 (13.2%)	7 (5.6%)	0.150
Typical lymphadenopathy*, n (%)	126 (77.3%)	32 (84.2%)	94 (75.2%)	0.246
Atypical lymphadenopathy*, n (%)	22 (13.5%)	5 (13.2%)	17 (13.6%)	0.944
Lymphadenopathy≤25 mm, n (%)	124 (76.5%)	34 (89.5%)	90 (72.6%)	***0.032***
Lymphadenopathy>25 mm, n (%)	25 (15.3%)	3 (7.9%)	22 (17.6%)	0.146
Typical micronodules*, n (%)	70 (42.9%)	16 (42.1%)	54 (43.2%)	0.905
Atypical micronodules*, n (%)	11 (6.7%)	5 (13.2%)	6 (4.8%)	0.130
Nodules or masses > 1 cm , n (%)	10 (6.1%)	4 (10.5%)	6 (4.8%)	0.244
Cavitary nodules, n (%)	3 (1.8%)	1 (2.6%)	2 (1.6%)	0.552
MPAD> 30 mm, n (%)	33 (20.2%)	13 (34.2%)	20 (16.0%)	***0.014***
MPAD/AAD >1, n (%)	29 (17.8%)	5 (13.2%)	24 (19.2%)	0.394
Radiological progression	32 (19.6%)	7 (22.6%)	25 (26.0%)	0.702

Abbreviations: GGO: Ground-glass opacity; UIP: Usual interstitial pneumonia; MPAD: Main pulmonary artery diameter; AAD: Ascending aorta diameter.*Typical lymphadenopathy; bilateral, symmetric hilar and right paratracheal dominant mediastinal lymph node enlargement.*Atypical lymphadenopathy; lymphadenopathy with an asymmetric distribution like isolated/ unilateral hilar lymph node or mediastinal lymphadenopathy without hilar lymph node enlargement.*Typical micronodules; multiple nodules with perilymphatic, perihilar distribution, and upper and middle zone predominance.*Atypical micronodules; solitary or unilateral nodules, nodules predominantly located in lower zones and have centriacinar or random distribution.

Table 3. Initial Scadding stages according to age groups.

Scadding	All patients (n=163)	Elderly (n=38)	Non-elderly (n=125)
0	24 (14.7%)	5 (13.2%)	19 (15.2%)
I	49 (30.1%)	15 (39.5%)	34 (27.2%)
II	75 (46.0%)	12 (31.6%)	63 (50.4%)
III	3 (1.8%)	1 (2.6%)	2 (1.6%)
IV	12 (7.4%)	5 (13.2%)	7 (5.6%)

Erythema nodosum has been previously reported to be less common in EOS patients, without any significant difference (9, 17, 19, 21, 22). In contrast, Kobak et al. assessed 20 elderly patients (65 years and older) and found a non-significant increased prevalence of erythema nodosum (10). Uveitis is the most frequent ocular involvement in sarcoidosis and has been generally reported as an increased finding in EOS patients, as in our study (9, 10, 19). Only arthralgia, as the initial symptom, predominated significantly in our EOS group. Arthralgia was detected less frequently in elderly patients by some authors than in younger patients, but no significant differences were reported between age groups (10, 19, 21).

Elderly patients are reported to exhibit a more frequent presence of extrapulmonary organ and lymph node involvement (8, 19, 21, 23, 24). In contrast, peripheral lymph node enlargement was found to be lower in elderly patients taking a cut-off value of 40 years of age in the ACCESS study (25). In the present study, we found that extrapulmonary lymphadenopathy was less frequent in the elderly, but the difference in occurrence rates was not significant.

The literary diversity in clinical findings may be attributed to the relatively small number of patients in the elderly group. Stadnyk et al, reported on a series of 17 cases of biopsy-proven sarcoidosis in patients of 65 years and older and found no characteristic diagnostic clinical features of EOS, leading these authors to suggest that tissue biopsy is needed to exclude the diagnosis (16). Chevalet et al., compared 30 patients 70 years and older with younger patients, and found that EOS was mostly present as an intrathoracic form. Still, there were no specific clinical findings, so these authors suggested that accessory salivary gland biopsy was an important contributing factor to diagnosis (20).

When evaluated in terms of clinical course, it has been stated that most elderly patients with sarcoidosis remained clinically stable during the period of follow-up (16, 20). Some other papers reported that the reduced survival rate in EOS may only reflect the consequences of aging (9, 17). It was also reported that less remission is exhibited in older patients, mainly because of pulmonary fibrosis, associated pulmonary hypertension, and the effects of treatment modalities (23, 26). In the present study, clinical remission rates were found to be significantly higher in younger patients. However, the development of chronic-progressive disease did not differ between groups. Radiological progression always accompanies clinically chronic-progressive disease in elderly patients. However, some of the non-elderly patients may remain clinically stable, despite radiological progression. This may be explained by the high prevalence of comorbidities in the elderly and age-related radiological changes in lung parenchyma tissue.

Diagnostic evaluation of initial chest CT findings showed that most of the EOS patients were at Scadding stage I (39.5%). Similarly, in the study of Varron et al, stage I sarcoidosis was detected in 44% of the elderly patients on CXR, while stage II disease was detected in 20% of the EOS patients (17). In a multicentre study by Schupp et al, younger patients presented predominantly with Scadding stage I, whereas higher frequencies of stage III or IV were noted in patients aged >40 years (27). In some other studies, no significant difference was found in disease staging in the elderly and non-elderly groups (10, 18, 19). However, in the studies referenced in this paragraph, the Scadding stages were determined by CXR, whereas in our study they were based on CT scans. It should be considered that classifying the stages by CT scans may change the results, and more frequent detection of subtle parenchymal changes, and micronodules may lead to an increase in stage 2 and 3 disease (28).

We did not find any significant difference in lymph nodes, in terms of atypical appearance and localization. Moderate lymph node enlargement between 10-25 mm in the short diameter measurement was significantly more common in the EOS group. Moreover, atypically distributed parenchymal micronodules, macro nodules, and cavitary nodules were observed more often in the elderly group in the present study. On initial radiological examination, some authors reported that atypical findings were more common in elderly patients (29-31). Since this atypical nodular involvement may cause difficulties in radiological diagnosis, pulmonary sarcoidosis should be kept in mind in the presence of multiple parenchymal nodules in the EOS patients. We detected sarcoid galaxy sign in 12 patients in the younger group, but not in any patients in the EOS group. The galaxy sign consists of a nodular core formed by the coalescence of granulomas and surrounding satellite micronodules. Koide et al, described this sign as highly specific for pulmonary sarcoidosis and also reported that the incidence was higher in non-elderly patients (32).

Fibrotic sarcoidosis was more frequent in EOS patients on initial CT in the present study. The frequency of the UIP pattern, predominantly peripheral and in the mid-lower zones, was significantly more likely in the EOS patient group, but was nevertheless a rare pattern. In some other reports, advanced stage IV disease was detected more in elderly patients (23, 27). Although honeycombing has been described in sarcoidosis, it is uncommon and rarely involves the middle and lower zones (30). There is little published evidence on this subject. The high smoking rates in these patients should be considered and further studies with larger numbers of patients are needed. Abeshera et al. evaluated the CT scans of 80 patients with fibrotic sarcoidosis and separated three CT patterns of fibrotic pulmonary sarcoidosis. They observed the honeycomb pattern, predominantly peripherally distributed, in 29% of patients, but did not observe a significant difference in terms of patient age (33).

Our study has some limitations: Firstly, our study was a single-center, retrospective study with

a limited sample of patients. In particular, the small proportion of elderly patients in the study cohort, and the inability to screen them for a longer duration of follow-up resulted in less data. The inadequacy of the data obtained may have caused a lack of significant results because of inadequate statistical power. Secondly, the age threshold for defining EOS seems to be an influencing factor. Although 65 years is the age limit for EOS in most studies, the adoption of different age thresholds may alter the findings and statistical significances identified. The clustering of non-elderly patients in the age group around 50 years may also be a limiting factor. Thirdly, since we are a tertiary referral care center, our patient group, especially the elderly group, possibly includes more severe cases of sarcoidosis. This may have led to an increased number of patients with advanced-stage sarcoidosis with pulmonary fibrosis.

In conclusion, the clinical findings are generally similar to the younger age group and are not distinctive. Arthralgia was more common in the EOS patient group, however, this finding may need further evidence given the increased incidence of arthritis due to non-sarcoidosis, such as rheumatoid arthritis or osteoarthritis, in the elderly group. Radiologically, EOS patients presented predominantly at Scadding stage I. Lymph node enlargement was often observed in a typical form in the EOS group, but the size of lymph nodes was moderate and not as large as in the younger group. Nodules were observed with a similar frequency in the EOS patient group, but atypical nodule formation was more common. These atypical findings included macro nodules over 1 cm in diameter, micronodules with atypical distribution, or cavitary nodules. However, the sarcoid galaxy sign was never present in our EOS patients. Scadding stage IV disease was diagnosed more frequently in EOS patients on initial CT and atypical forms of fibrosis seem to be prominent in elderly patients. Radiological worsening was more frequently associated with clinical worsening in elderly patients than in younger patients and may have prognostic value.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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